ELECTRICAL TIMES

THURSDAY
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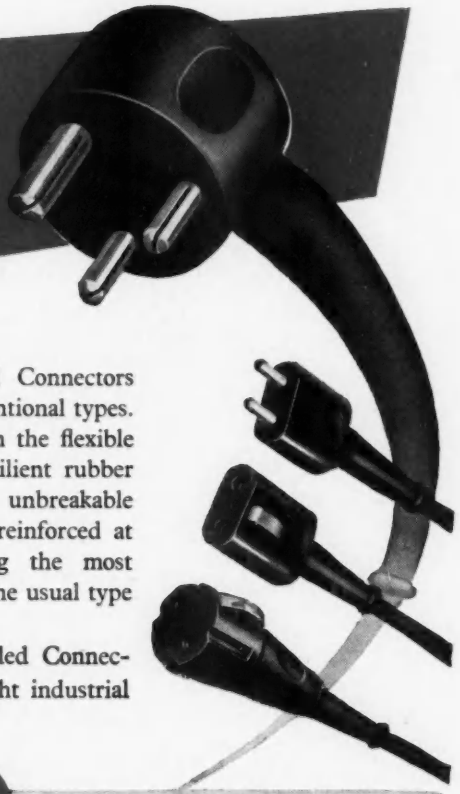

These BICC Resilient Moulded Connectors give years longer service than the conventional types.

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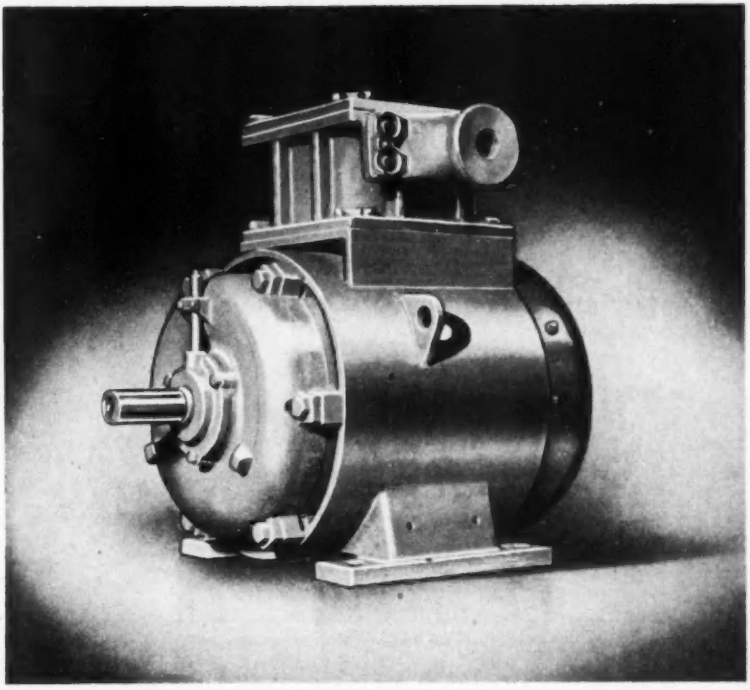

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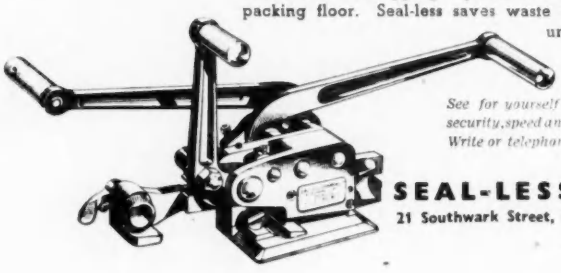

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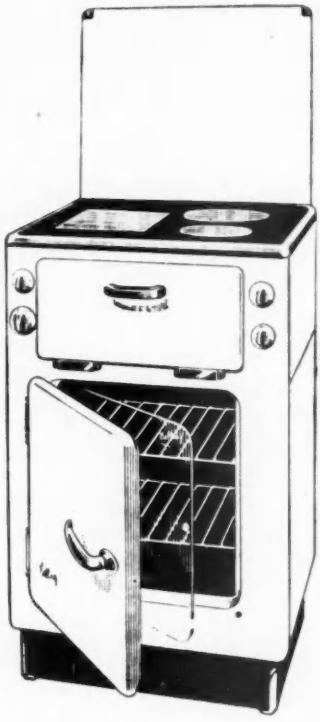

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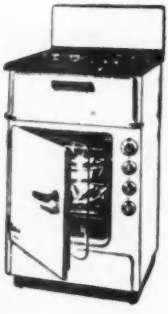

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The left-hand illustration shows six central flow band screens having a combined capacity of 15,000,000 gallons per hour of sea water, and that on the right shows an installation of two cup type screens with a combined capacity of 6,000,000 gallons per hour.

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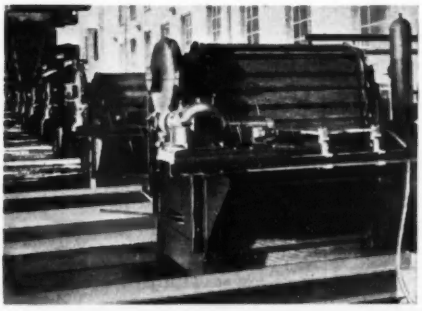

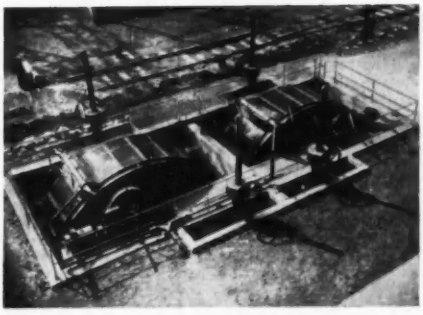

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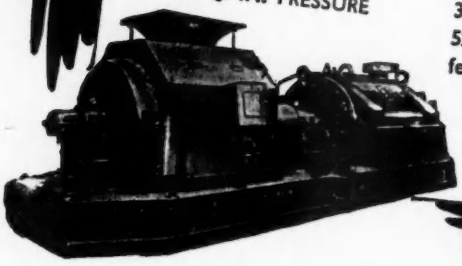

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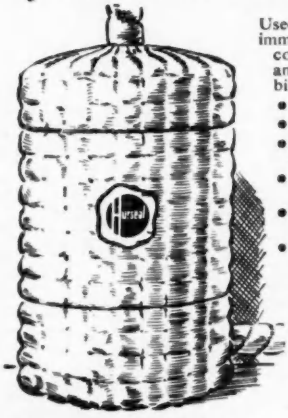

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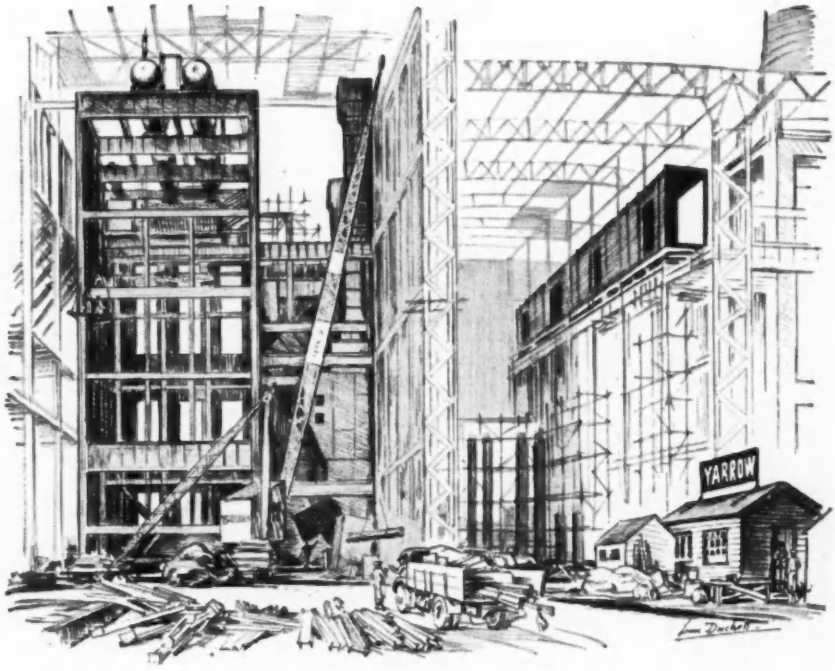

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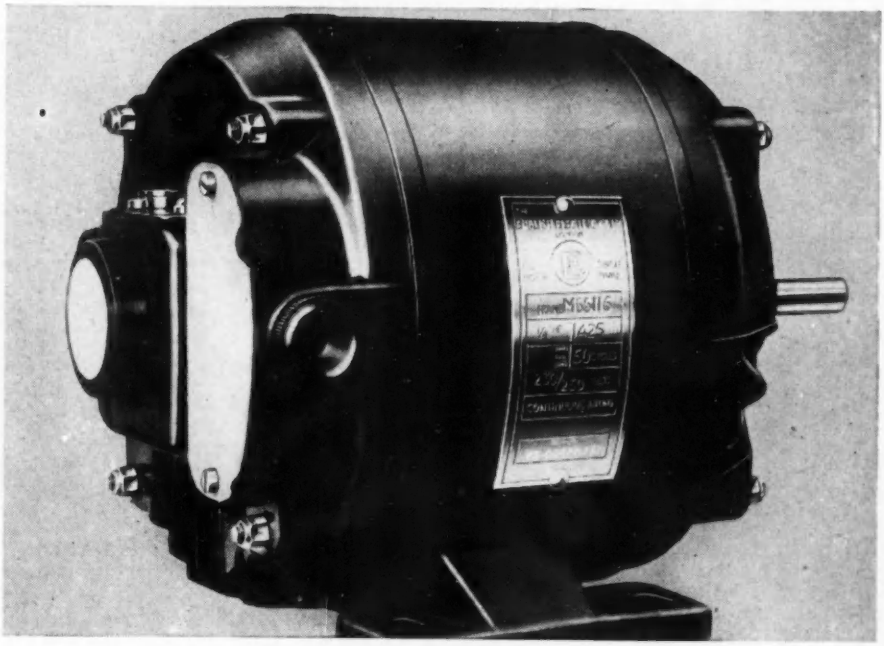

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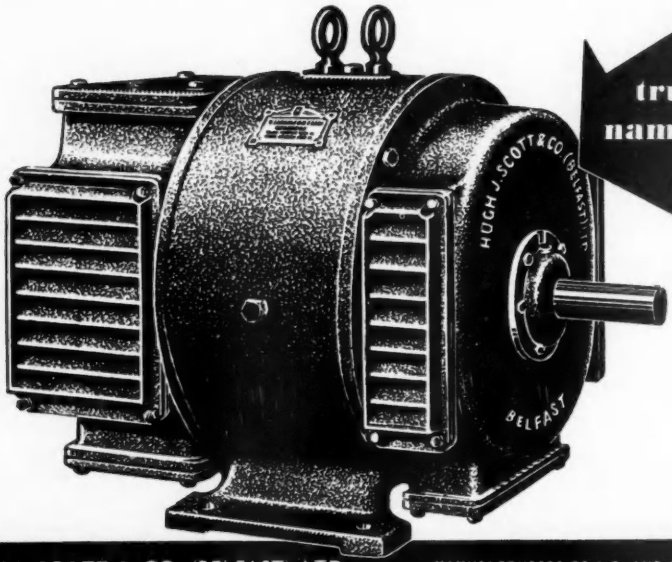

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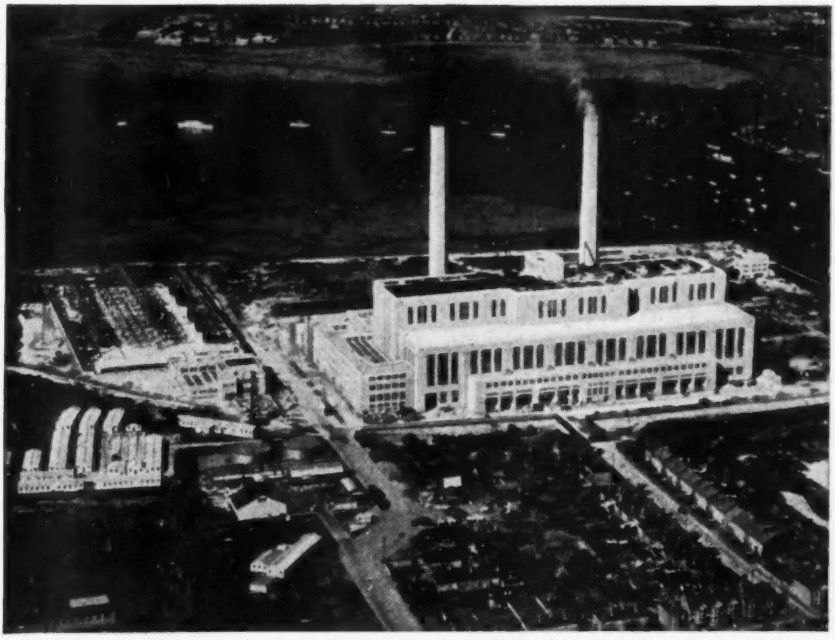

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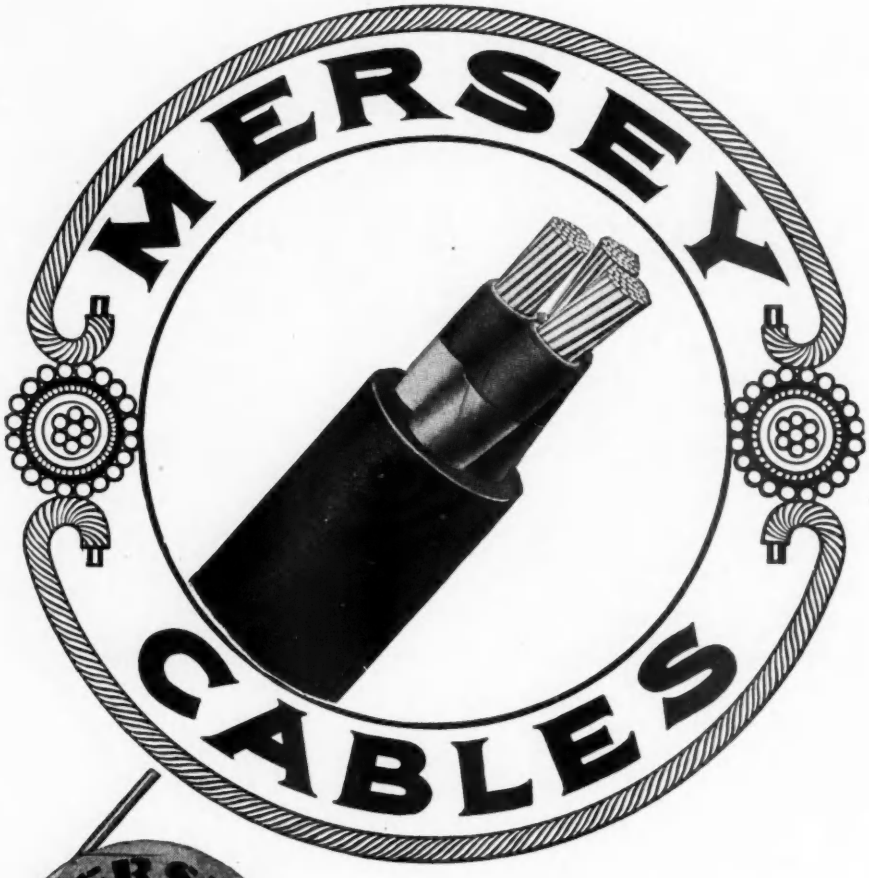

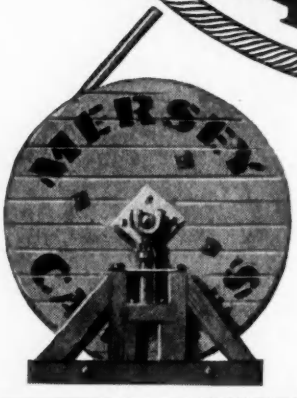

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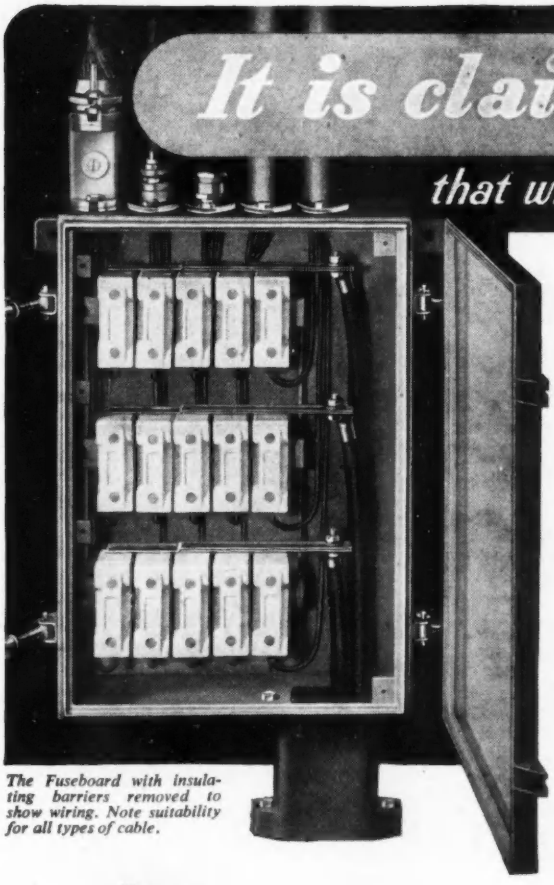

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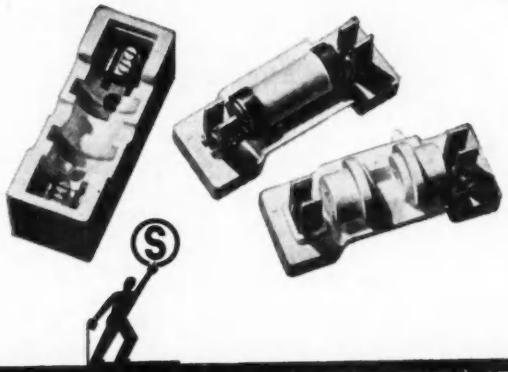

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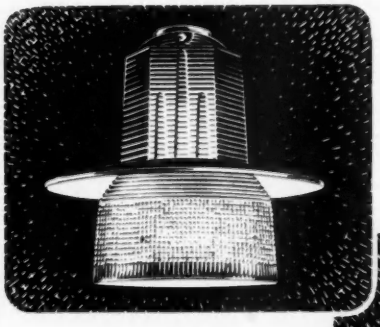

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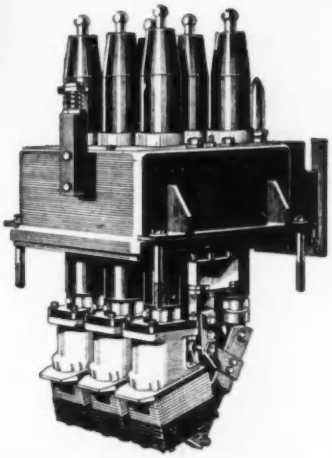

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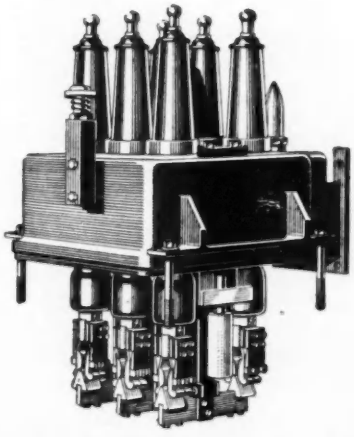

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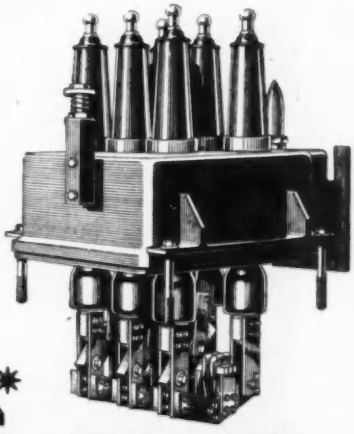

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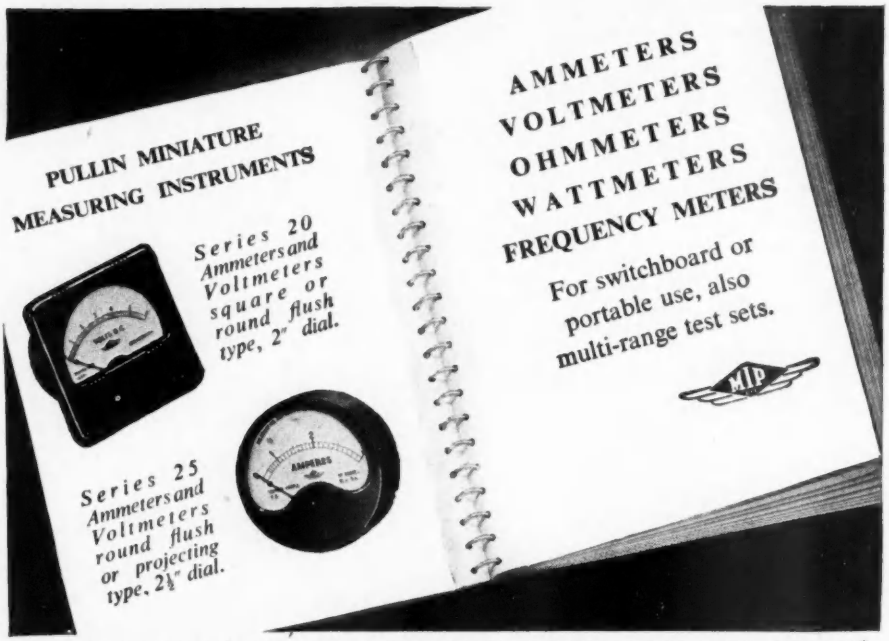

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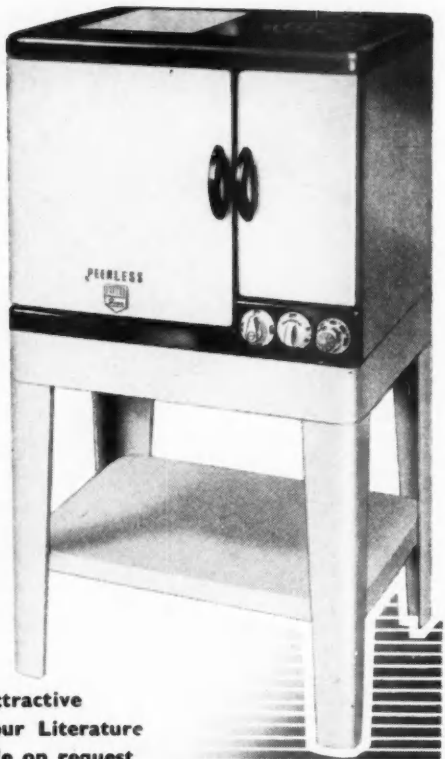

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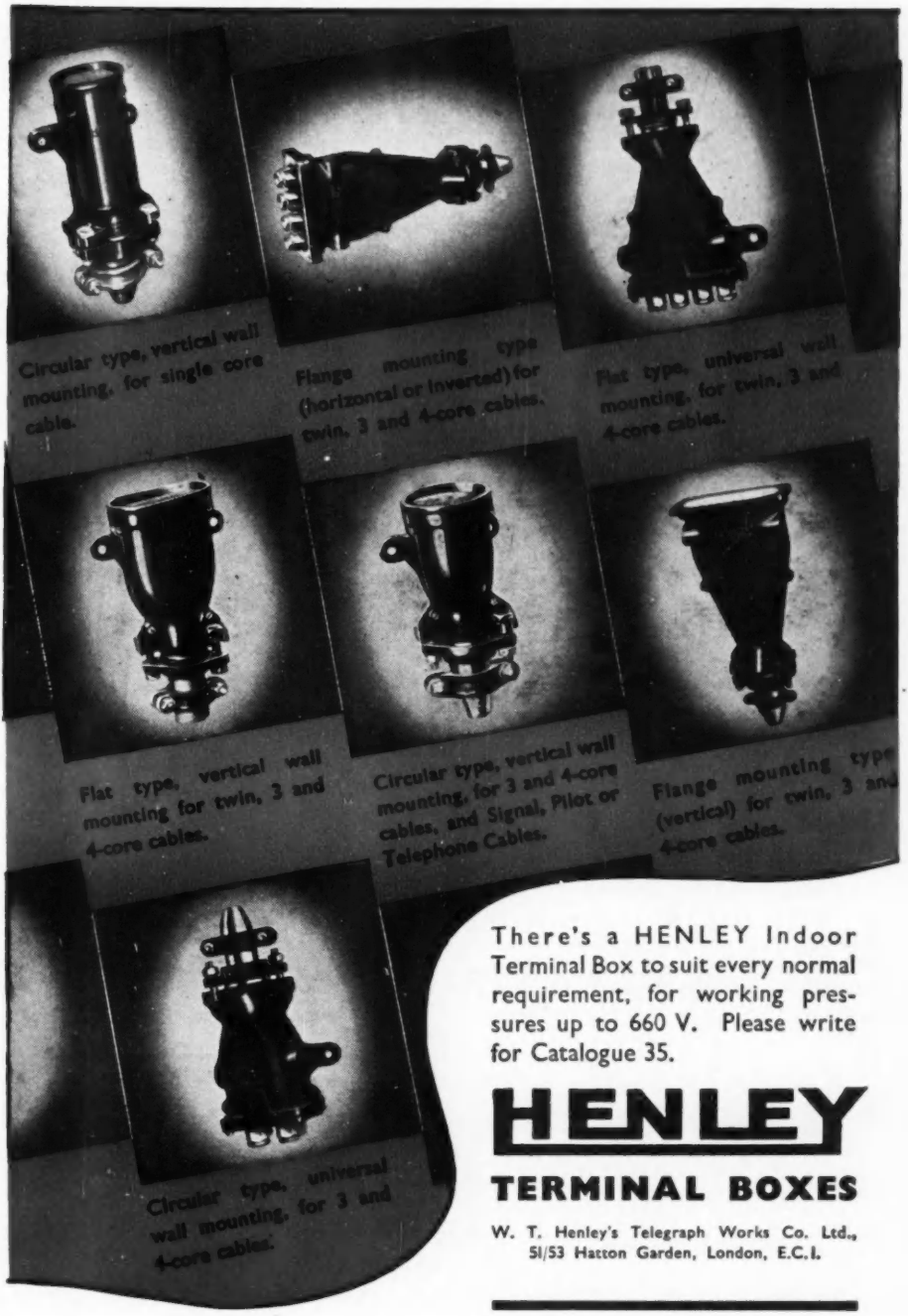
Circular type, vertical wall mounting, for single core cable.
Flange mounting type (horizontal or inverted) for twin, 3 and 4-core cables.
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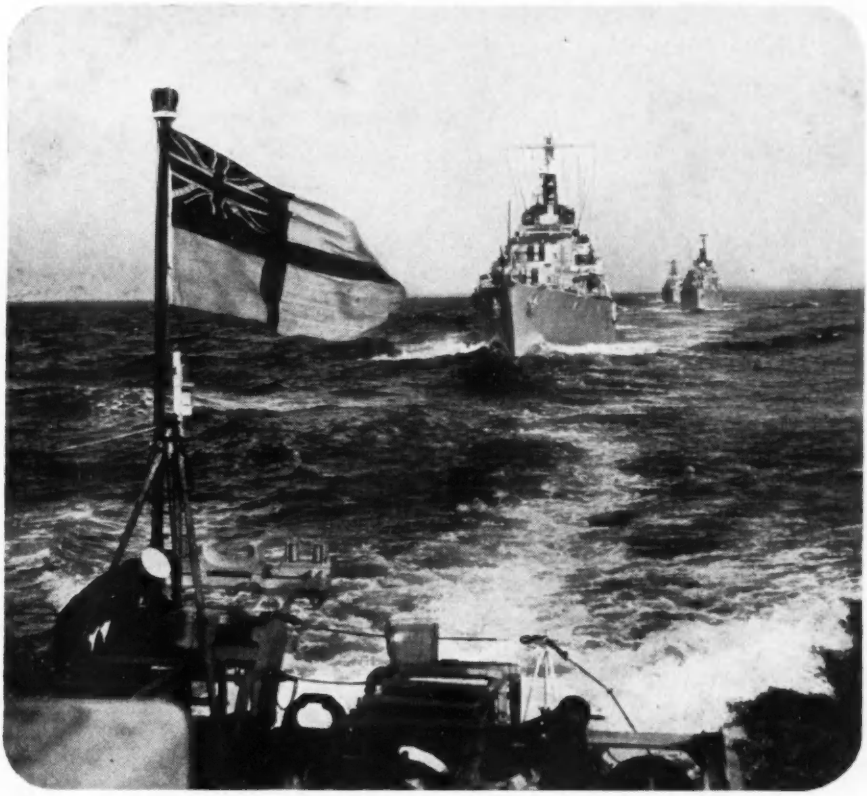

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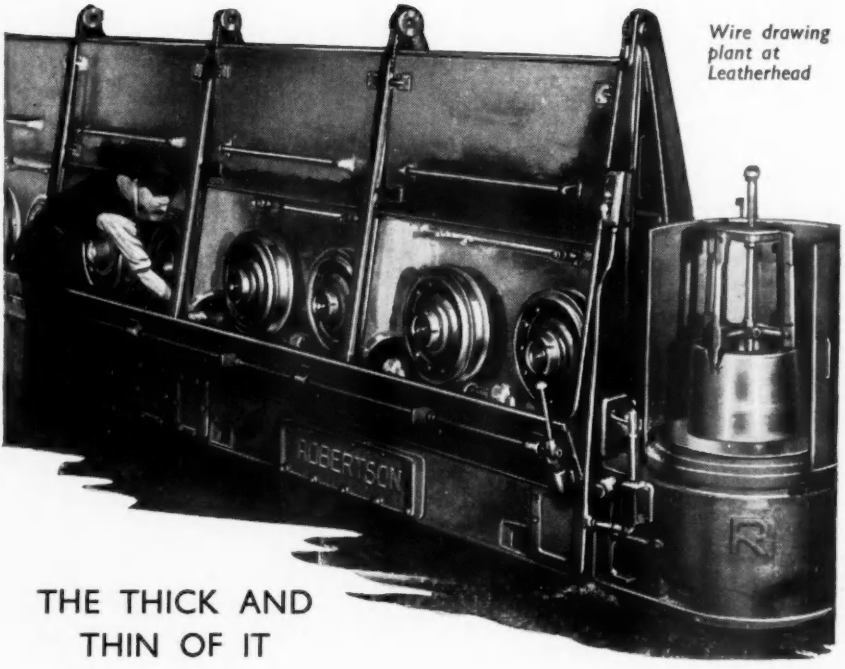

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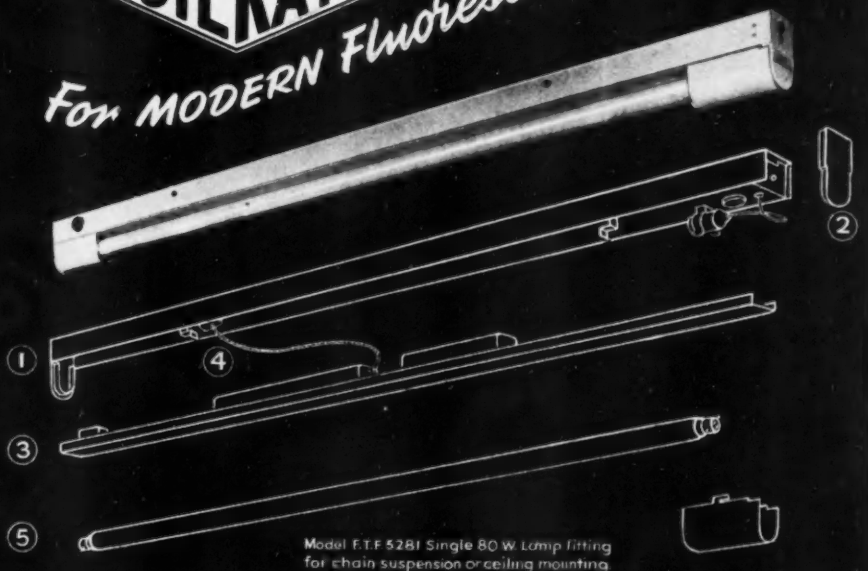

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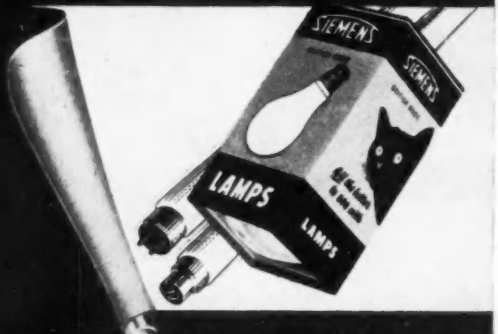

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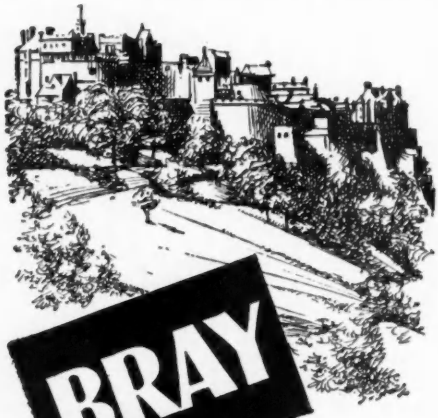

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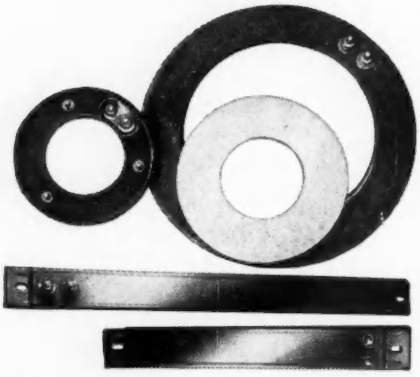

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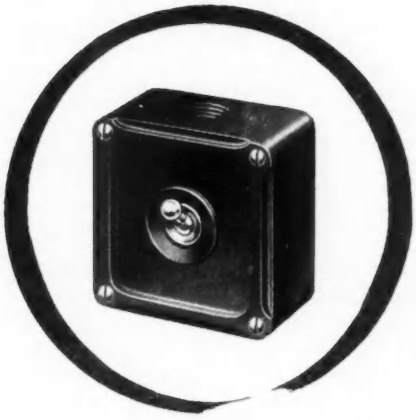

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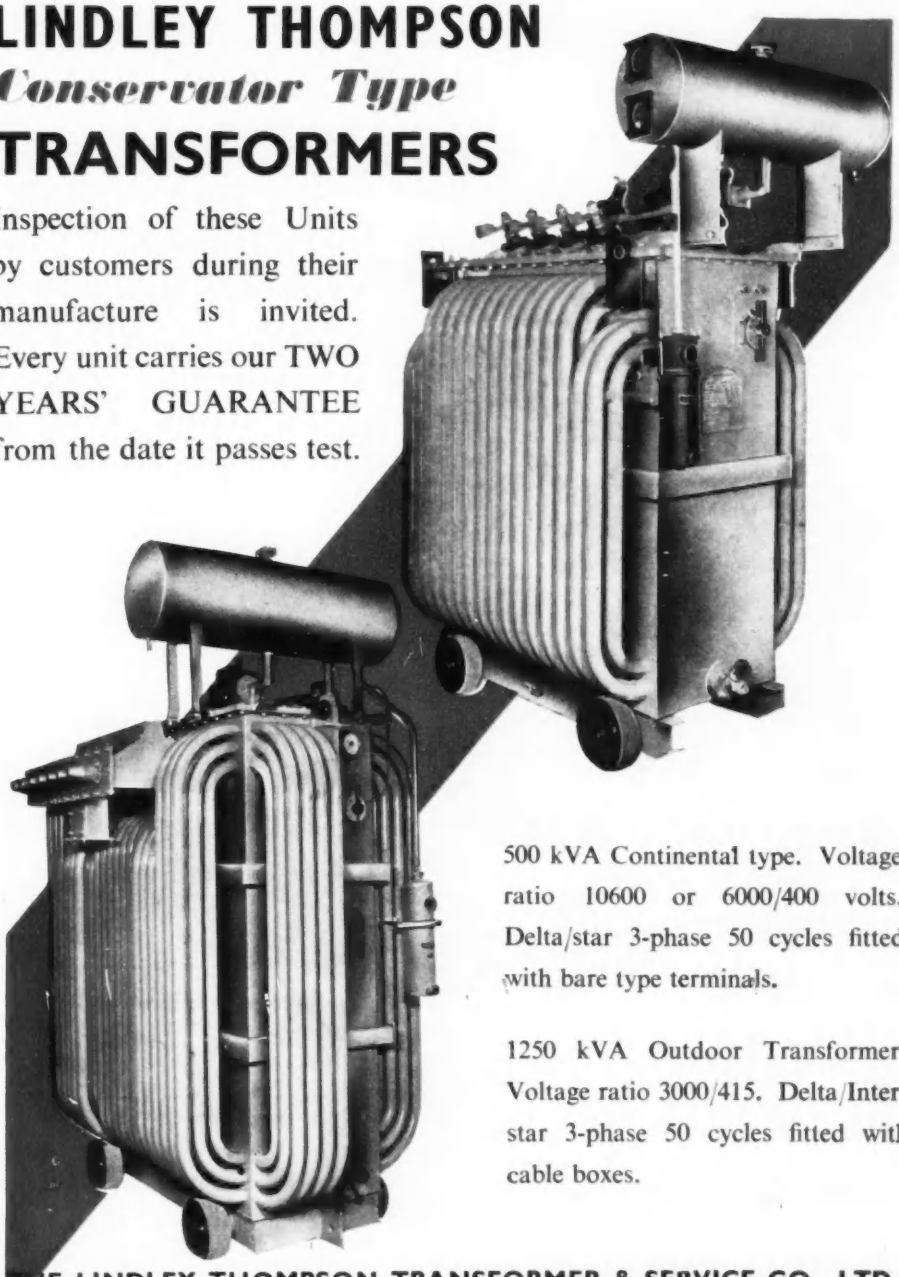

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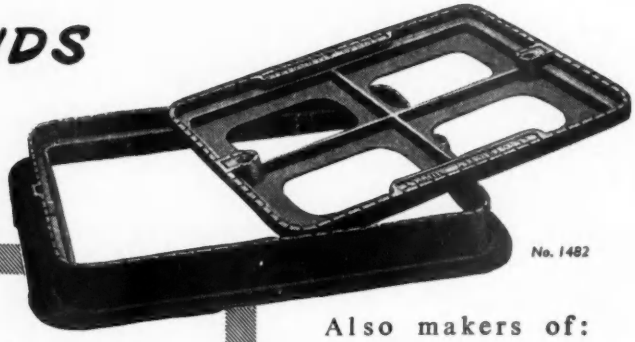

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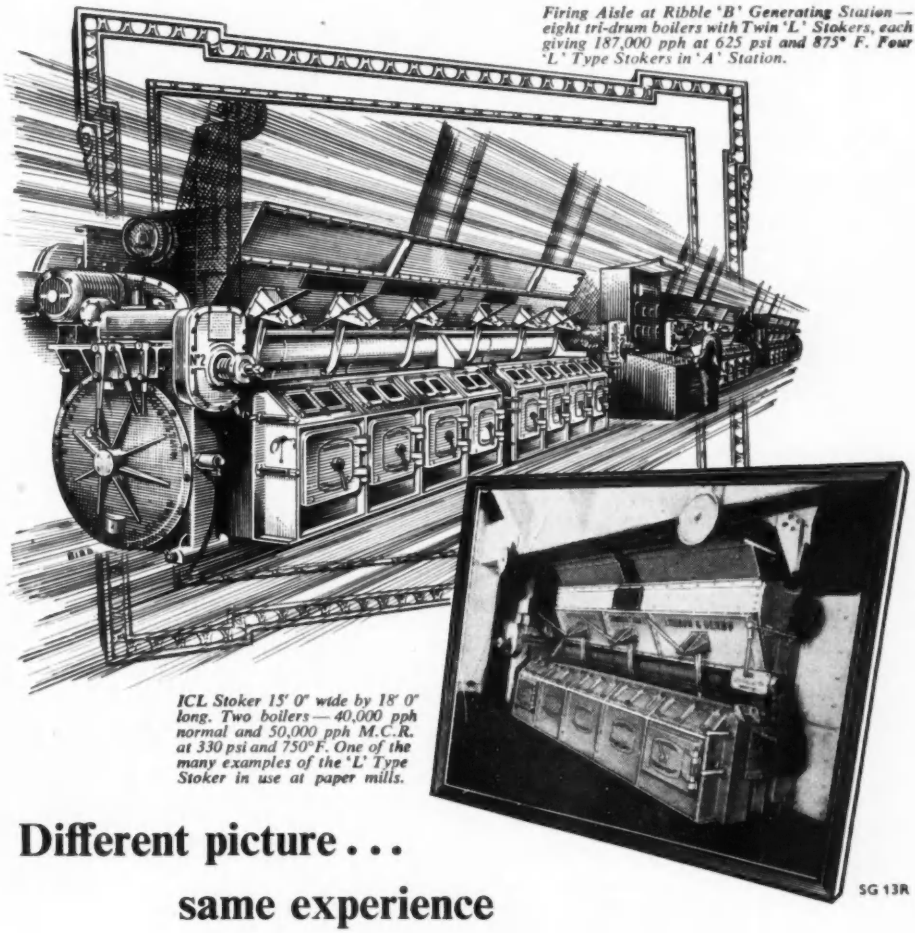

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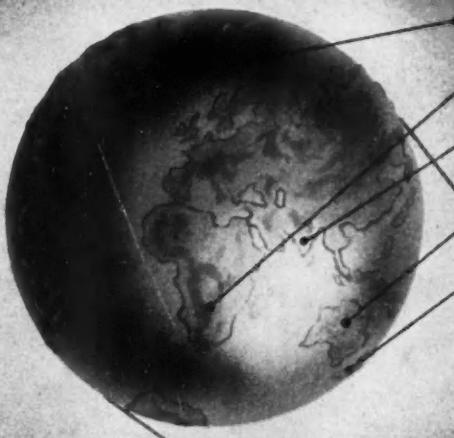

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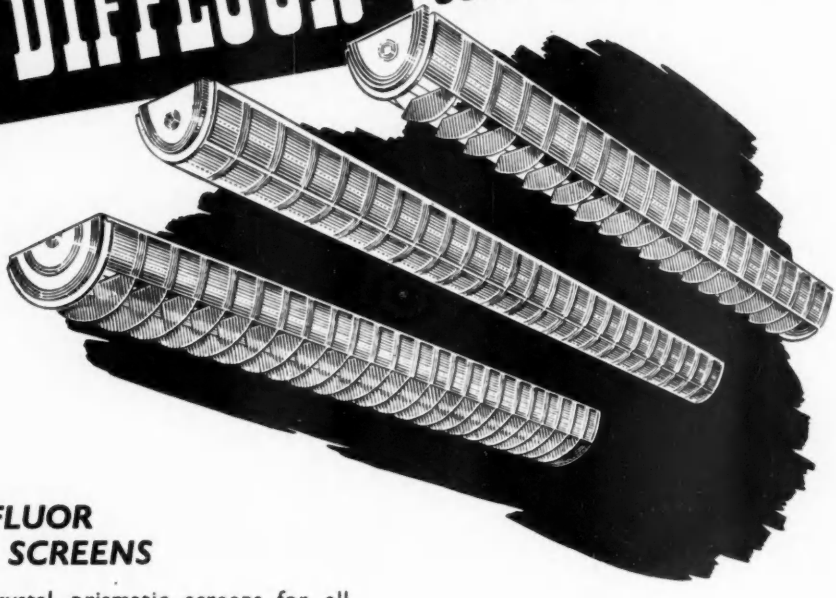

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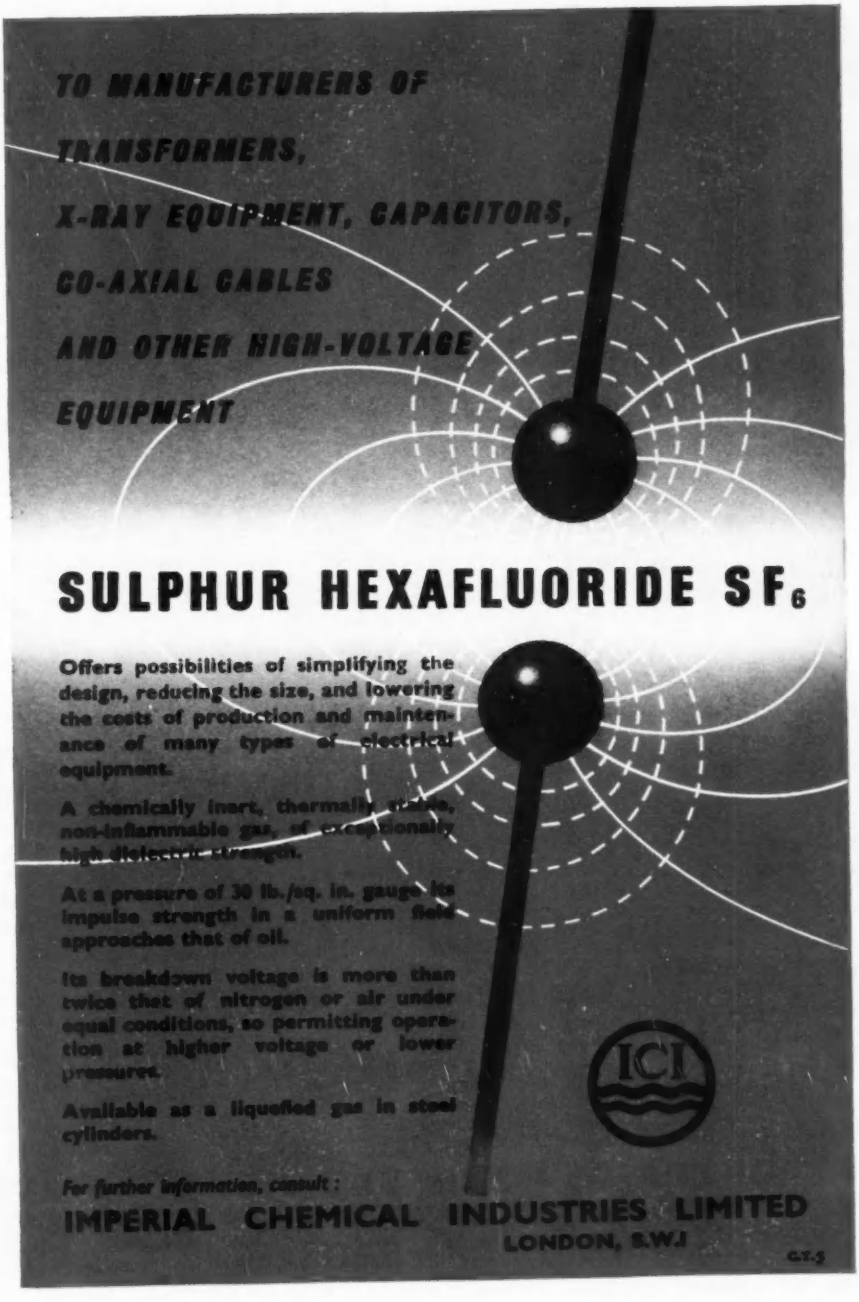
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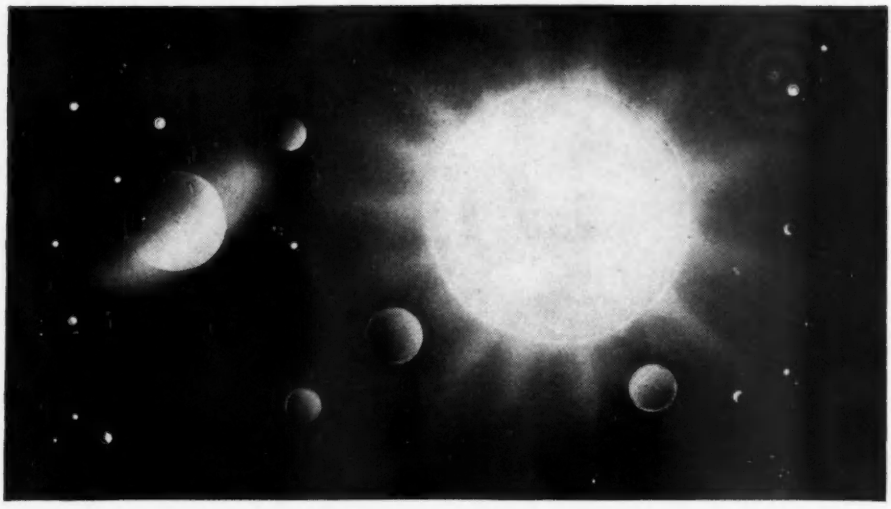

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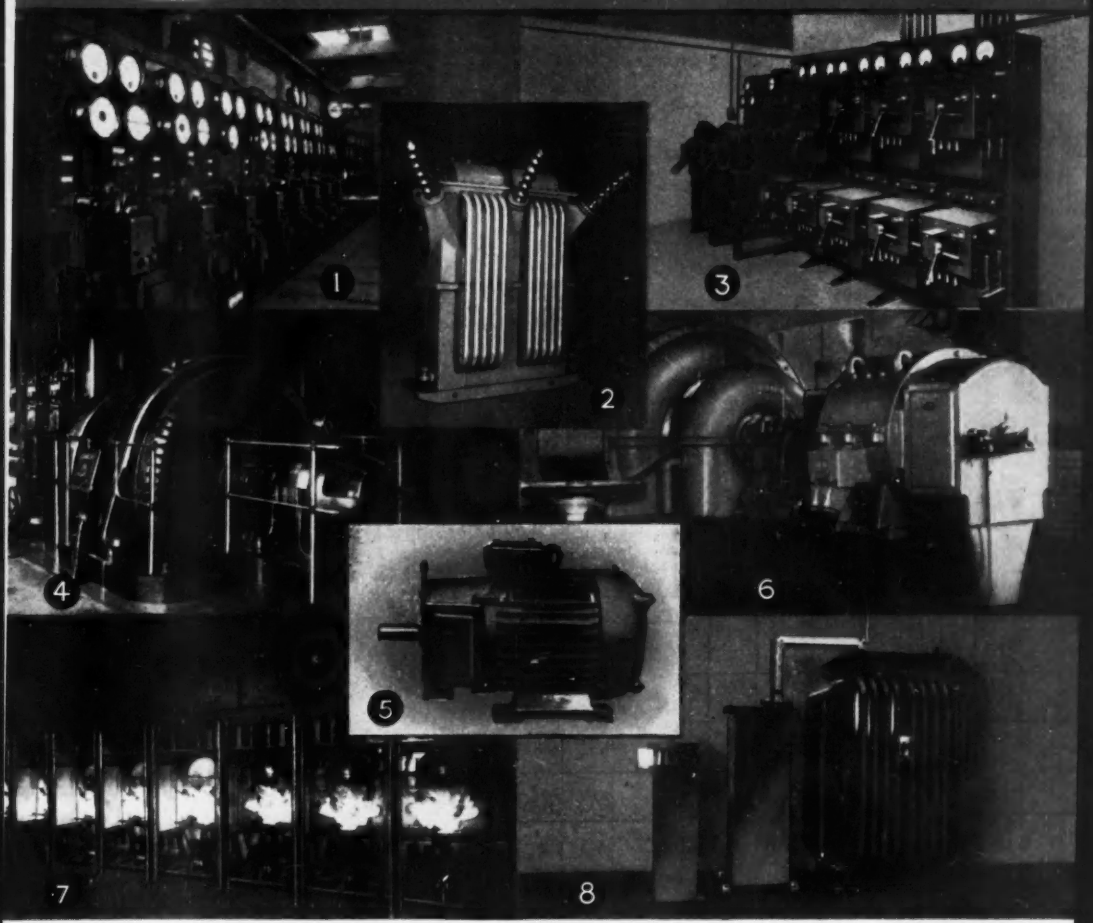

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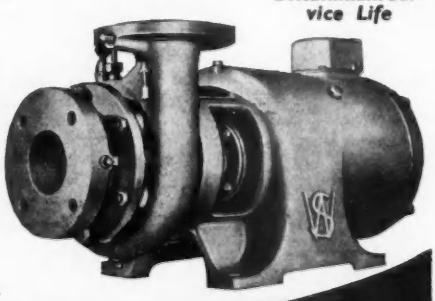

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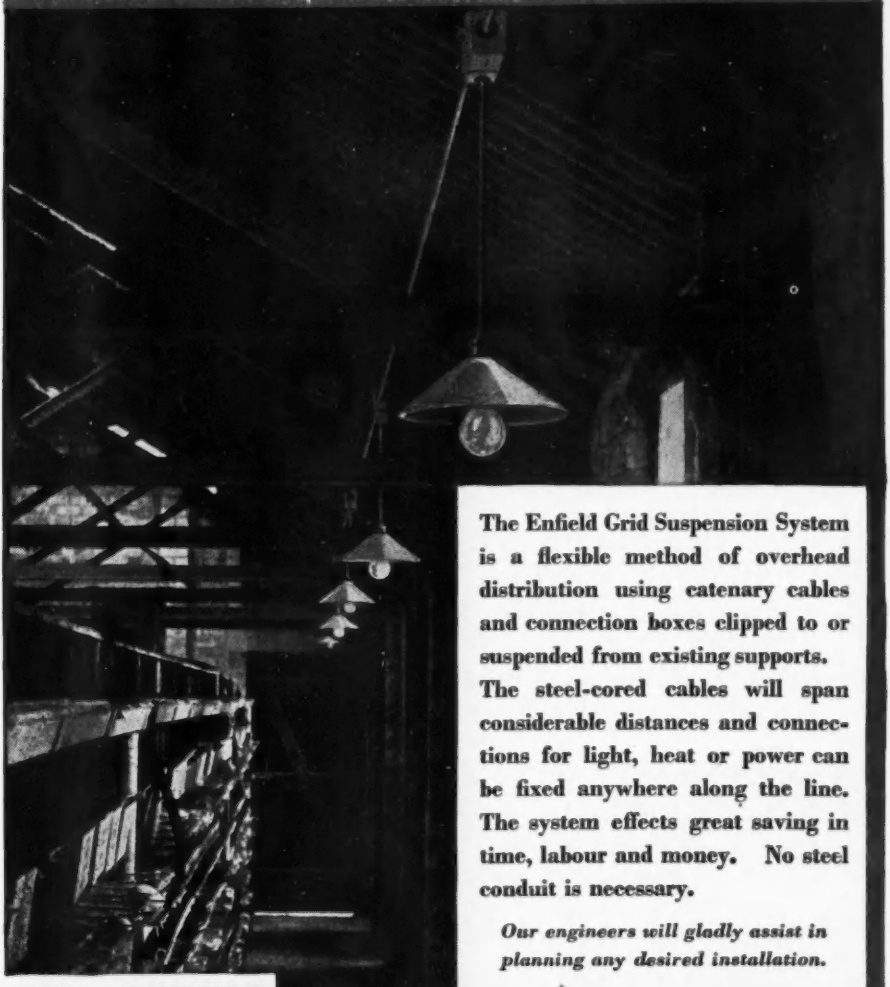

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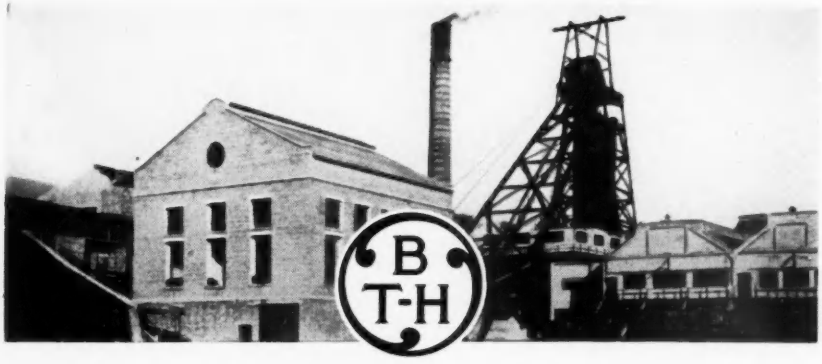

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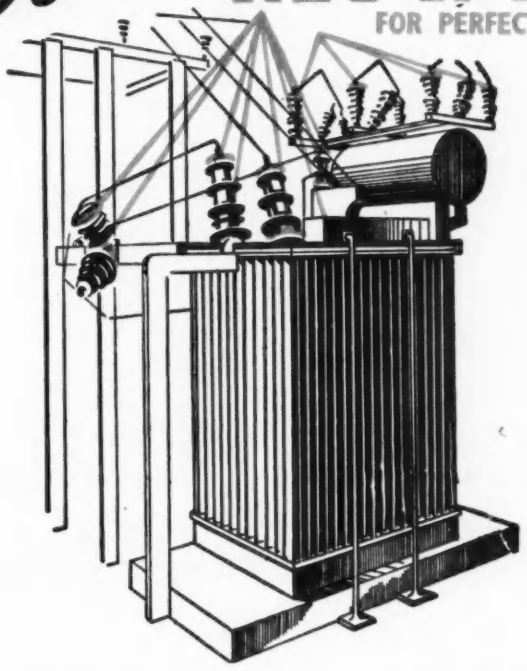

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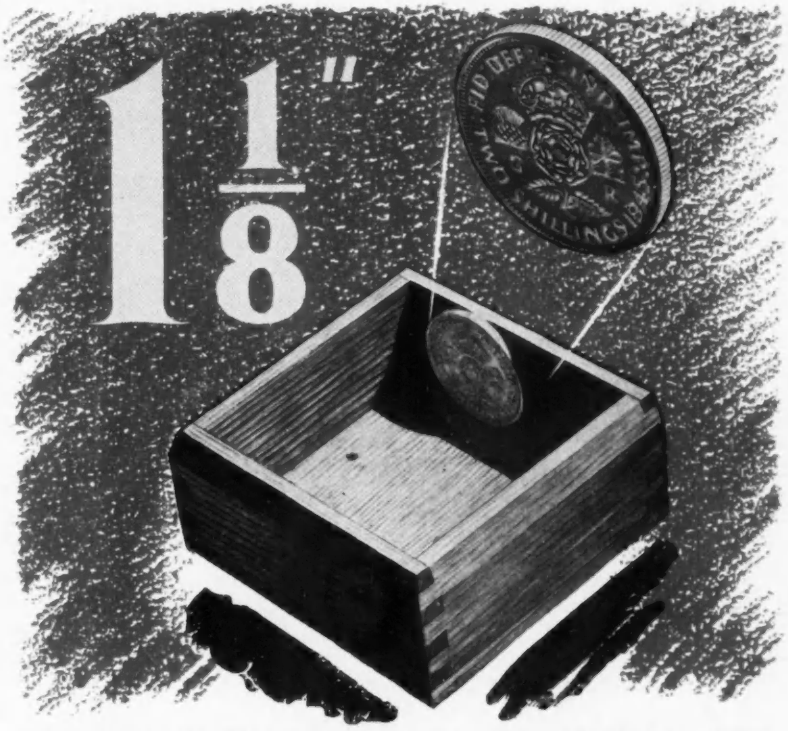

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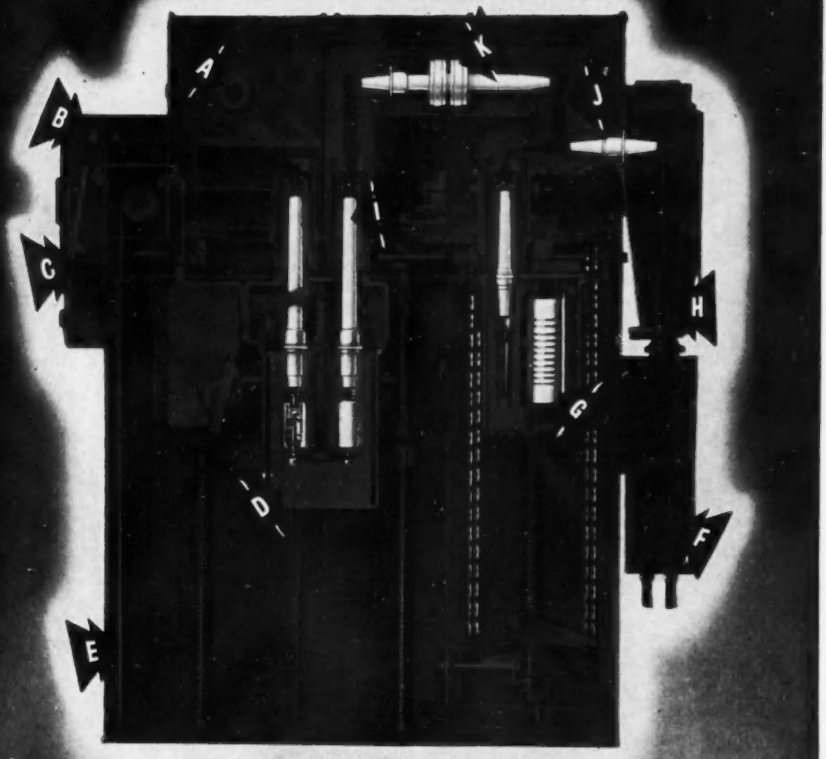

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A Condenser bushing busbars
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C Door giving access to the ancillary apparatus
D Low oil content circuit breaker
E Roller shutter enclosing front of the unit
F Multi-core cable box conveniently situated behind unit
G Voltage transformer
H Cable boxes suitable for all types of cable
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J Oil-filled connecting chambers facilitate removal of current transformers
K Current transformers mounted on condenser bushings are readily accessible

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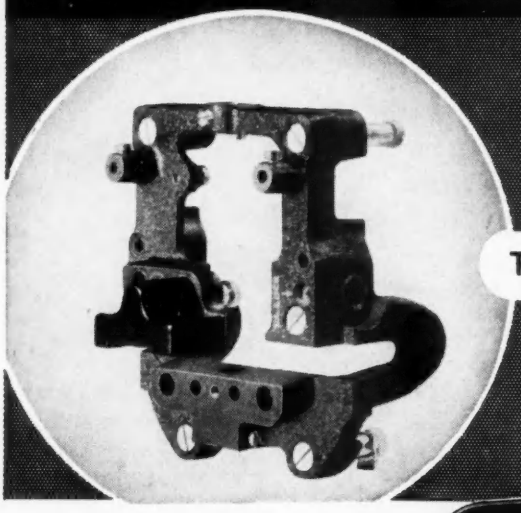

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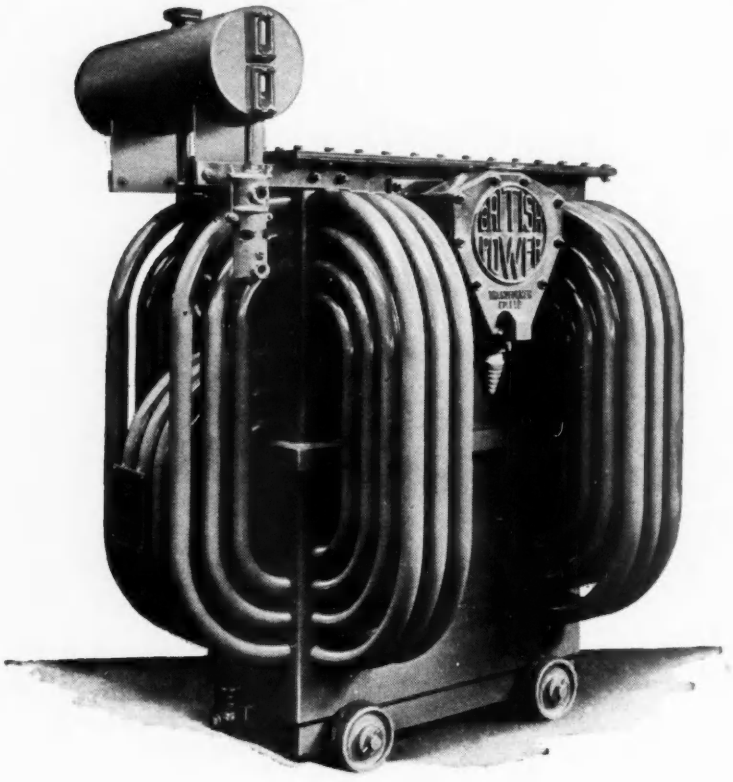

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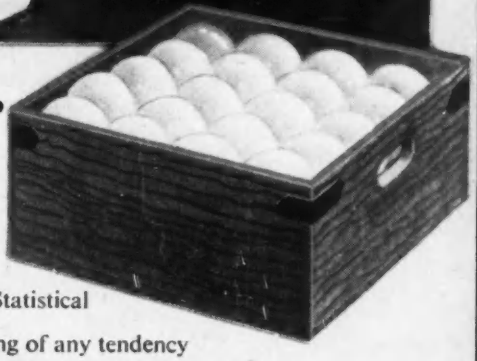

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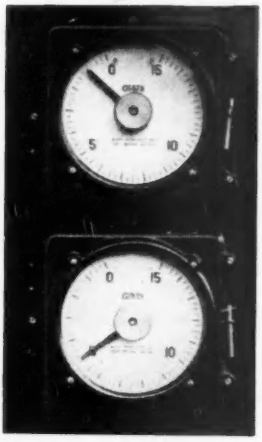

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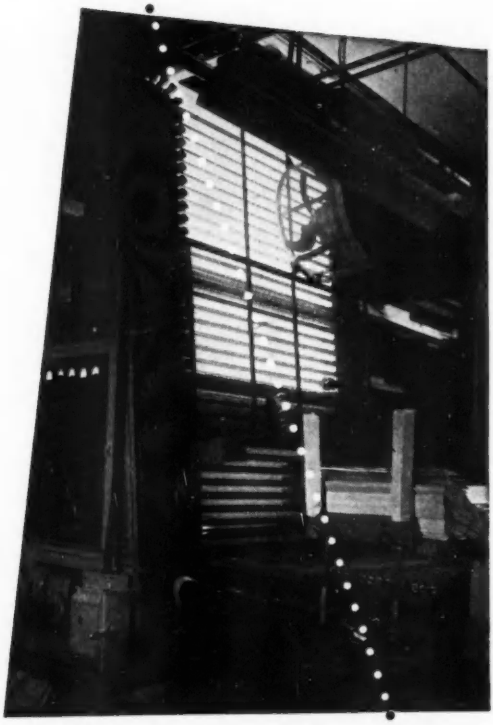

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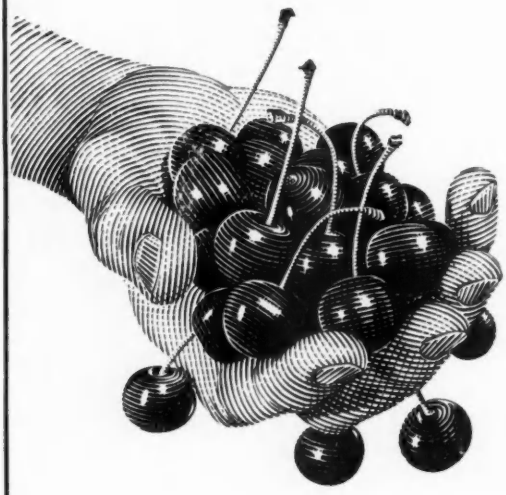

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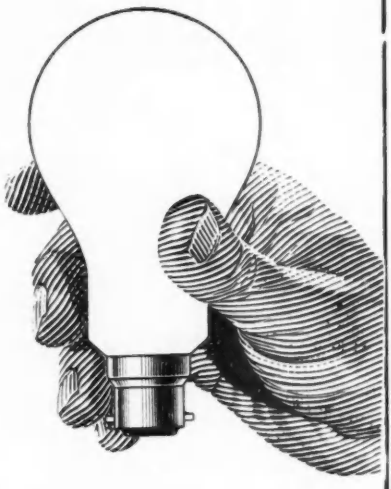

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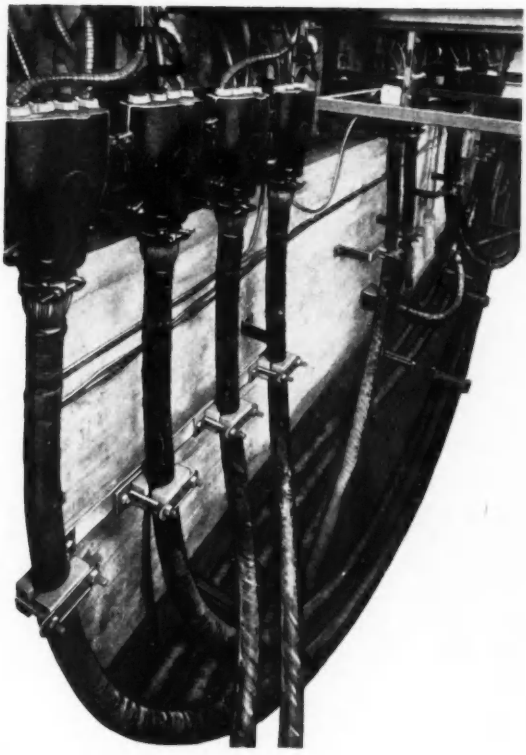

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The illustration shows a sectioned B.S.A. Bantam fork tube with M.P.C. high duty porous bronze bushes sweat soldered with Fryolux solder paint. The bushes are coated externally with Fryolux solder paint, inserted into the fork tube and heated by high frequency method. "Fryolux" solder paint shows a great advantage over all other methods for all sweat soldering purposes.

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ELECTRICAL TIMES

Vol. 121 No. 3148 THURSDAY, 6 MARCH, 1952

PUBLISHED EVERY THURSDAY

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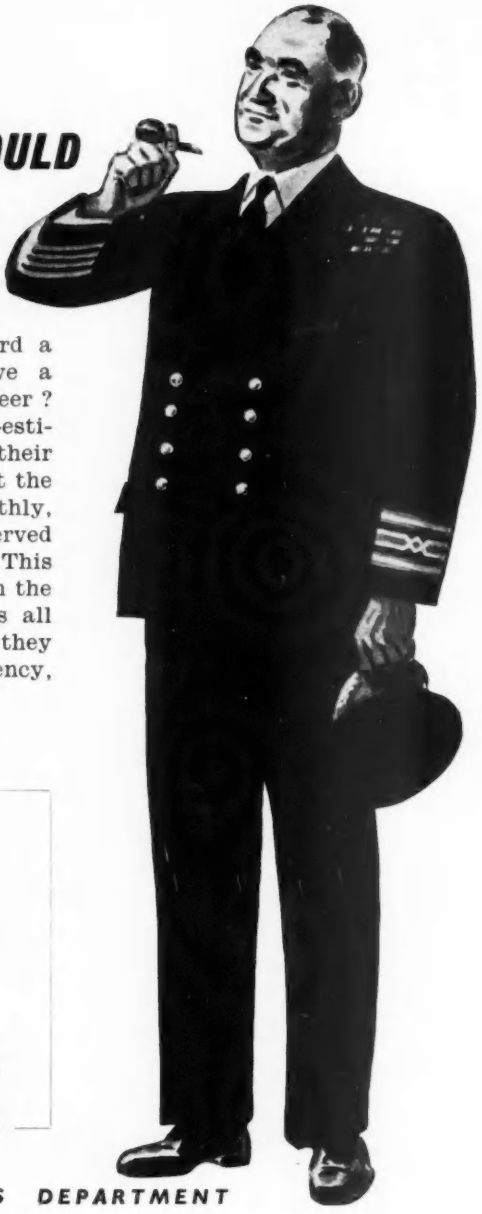
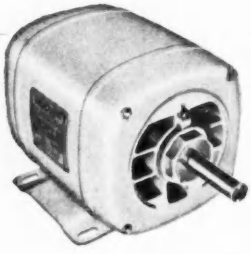
WITHOUT HIM THEY REALLY *WOULD* BE ALL AT SEA!



Of all the passengers aboard a liner, how many ever give a thought to the ship's engineer? Yet it is impossible to over-estimate his contribution to their welfare and comfort. In just the same way — quietly, smoothly, meticulously—Industry is served by the Hoover F.H.P. Motor. This is a 'fractional' that has won the confidence of manufacturers all over the world. They know they can trust its quality, efficiency, and dependability.



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Editorial

AREA BOARDS' DUTY

FOR some weeks now there has been discussed in our pages the part that the electric fire should play in our present fuel economy. At the present time all the resources of officialdom—recommendations, directives and purchase tax—are aimed towards encouraging the undiscriminating use of solid fuel. Yet even the severest critics of the electric fire agree that for short period usage it is cheaper and more economical in actual fuel used. Mr. Humphreys in his recent article showed that the time of use for which the electric fire is more economical than solid fuel fires from the point of fuel conservation extends from 9 to 13 hours, a conclusion which has not been contested. In these circumstances it is plainly the duty of area boards to give guidance to their consumers on the proper coordination of heating facilities so as to provide maximum fuel conservation. Unfortunately, in this duty, area boards have been negligent. It would seem almost as though they have acquired the Ministry's inappreciation of the need of coordinated fuel usage in the national interest. The present time is particularly opportune for urging the proper recognition of the electric fire, for if consumers can be encouraged to use electric fires for the shorter heating periods required in the between-season months, a considerable overall saving in fuel will be achieved.

TARIFF RETURNS

LAST week's announcement by the B.E.A. of increased bulk supply tariffs to be applied from April raises the question of the margin by which the Authority will cover its costs in the coming year, 1952/53. Taken alone, the 3s. per kW increase in the maximum demand charge will bring in about £2·1m during the year, but this in itself may well be insufficient to cover expected effects of increases of wages and the higher annual charges on new plant. But operating conditions are never static, and a closer inspection of the tariff suggests that increases in revenue may be substantially higher. For instance, the adjustment of the remaining charge by an extra 0·0007d per unit for every penny a ton increase in the delivered price of coal results in the Central Authority gaining about 0·09d for every ton burnt at a penny a ton higher price. At this rate the increases last December in the pithead price of coal and in transport charges should net the Authority about £1m in a full year. But this is not all; advances in the efficiency of generation mean that the price charged per unit will be higher, in relation to basic coal costs, than it has been in the present year of account. The hidden gain arising from an absence of any adjustment to this running charge of the tariff is estimated at £1·3m in a full year. Thus the new bulk supply tariff, when considered in all its aspects, seems worth some £4·4m to the B.E.A.'s income in 1952/53; to this will, of course, be added the greater return resulting naturally from increased business.

NOT THE RETAILER'S JOB

THE electrical industry should welcome the Heating Appliance (Fireguards) Bill, introduced last week, even though the fitting of guards to electric fires will involve greater responsibility and expense. Not all, however, will approve the method of enforcing the use of guards. The responsibility is placed wholly on local authorities for seeing that appliances conform with regulations. Whether they can be reasonably expected to have facilities for the necessary testing will not be clear until the regulations themselves are available. Although the Bill would appear to give power to local authorities to act wherever a sale takes

place—at manufacturers, wholesalers or retailers—presumably they will operate mainly in respect of retail sales. Thus the onus will be on the retailer to see that the regulations are complied with. This is neither fair nor practicable. The only satisfactory way of operating this limitation is by the use of a national mark for tested fires, showing conformity with the regulations, and the trader's responsibility should be limited to ensuring that only approved fires are sold in his shop. Only in this way will it be possible to avoid senseless duplication of work, misunderstanding of responsibility and the danger that through laxness on the part of local authorities, the effect of the Bill may in part be nullified.

INTERNATIONAL COAL POLICY

CLOSER study of the United Nations Economic Commission for Europe analysis of the European coal problem, which was briefly reviewed in our columns last week, confirms a first impression that it is likely to be an explosive weapon in the hands of the solid fuel enthusiasts. Discrimination in coal prices, a modified tariff system, automatic peak load restriction, and increased factory generation of electricity are all familiar as suggested panaceas for the fuel troubles of the nineteen fifties, and they are examined again in a new guise in this international document, though mostly without any new arguments to support them. The most interesting treatment is that accorded to the question of the tariff system, in its application to the domestic consumer. Two-part tariffs and their variants are conceded to be logical enough in relation to the costs of electricity supply considered in isolation, but they are criticised for not covering in their running charge component the "true marginal social cost" of the large domestic user's consumption. This somewhat foreign concept of social cost is developed with reference to conditions of power plant shortage and of relative coal shortage, with the background of a pan-Europe economy rather than the narrower aspect of national conditions. Exports that have to be foregone through the demand for electricity should, the inferred argument goes, be charged to electricity consumers. Careful thought should be given by the supply industry and by the official representatives of consumers in particular, to this dangerous theory, for the independent observations of the Unesco secretariat are likely soon to be backed by partisan arguments.

SUCCESSFUL SPREADING

LAST week's official verdict that the need for intensive load spreading is now past for this winter, draws attention to one of the outstanding features of the past few months: the absence of the expected large scale power cuts. When, in August last, the Electricity Sub-Committee of the Minister of Labour's Joint Consultative Council published its review of the power position for the winter to come, the severe-weather deficit of plant was estimated at 3,100 MW. It was concluded that even with industrial load spreading on the largest practicable scale and with demand restriction by frequency and voltage reduction carried out to its greatest extent, considerable periods of load shedding would still be necessary. Yet, in the event, load shedding has been negligible, and the effects of voltage reduction less than in former years. In the earlier part of the winter, mild weather no doubt helped considerably to reduce demand, but it has been noticeably colder since Christmas, and still extensive cuts have not come. Sir John Hacking, Mr. Noel-Baker and Sir Walter Monckton have all paid tribute to those most concerned in this achievement: the B.E.A., on the one hand, in its drive for reduced plant outage and its speeded installation programme, and managements and workers on the other, for all have co-operated at considerable inconvenience to themselves with notable success in a country-wide scheme. The inconvenience was less than that occasioned by power cuts: this is surely the abiding memory of this winter, and the watchword for the next.

Meteor

REMOTE CONTROL of Circuit-Breakers

The use of high frequency signals transmitted on the supply mains for load shedding purposes

By T. V. LIRONI, M.I.E.E.

THE present necessity of providing facilities for shedding a high proportion of the system load at short notice has given operation engineers a number of difficult and often intractable problems.

The instructions to shed various stages of load in steps of 5% are normally transmitted to the operating staff at each main point of supply. In the Sub-Area under consideration there are three such points.

The first two 5% stages of load shedding are usually met by reductions in voltage and if this is to be wholly effective, it entails the locking of all automatic 'on-load' transformer tap changers on the system. This can, of course, be done manually in advance at the expense of poor system voltage regulation over a period longer than necessary.

Further stages of load shed in steps of 5% are provided by switching out portions of the distribution network, selected in advance.

It is not usually possible to provide these stages in a complex network by opening the feeders at the main substation controlling the point of supply. The load on any one feeder rarely approximates to the required 5% of the system load and, moreover, such a feeder may have connected to it some special loads which cannot be cut for reasons of safety.

It will be perceived, therefore, that in order to jettison load by approximately the desired amounts, and at the same time to avoid cutting off special loads, it is necessary to disconnect predetermined portions of the network by opening feeder switches in remote substations. It is, moreover, imperative that such operations be carried out expeditiously following the receipt of notice to shed.

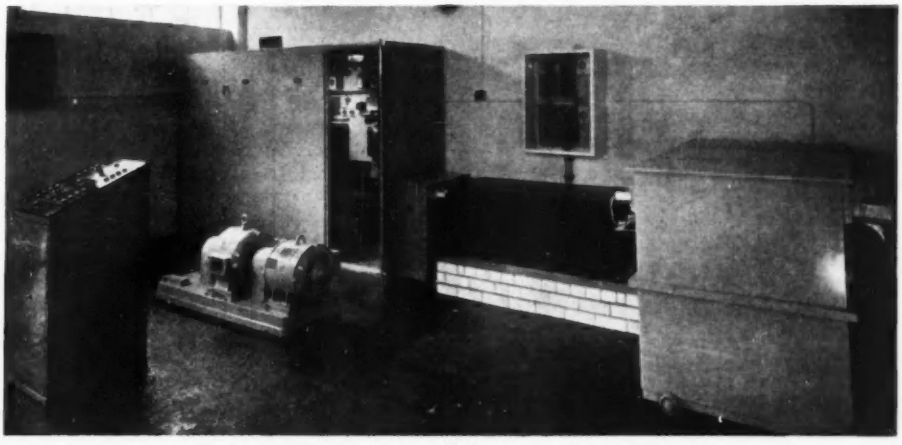
It cannot be stressed too strongly that the prompt response to a request to shed a stage of load will often obviate the necessity of initiating a further stage.

Remote Control

To meet the foregoing requirements it is desirable to have, in the absence of a supervisory control system, some method of tripping from the main substation, pre-selected feeder switches in remote substations.

Before the facilities to be described were

The control desk and injection equipment installed on the 6·6 kV system at Birkenhead



provided, it was necessary to locate operating staff at remote substations throughout the "load shed risk" period with instructions to trip selected circuit breakers on receipt of telephone requests.

A large number of staff and transport were immobilised for this purpose to the great detriment of the normal work of the Sub-Area. With the new system it is found sufficient to have one operator only available in each District for the purposes of reclosing such switches as may have been opened to comply with the day's load shedding requirements.

In the few instances where pilots with spare cores existed these have been brought into service for tripping purposes, employing interposing relays in the trip circuits of the appropriate circuit breakers.

Existing Ripple System

In each of the three Districts of the Sub-Area, there are installed ripple control installations injecting on to the high voltage system in each case. A special feature of these three equipments is that all operate on the same frequency and employ identical signals for the same services. This enables relays for the same services, such as water heater control, to be interchangeable throughout the Sub-Area. Signals from one District can also operate relays in another, if a network alteration makes this desirable, and renders harmless the effects of signal spill-over.

Each of the equipments provides for a total of twelve signals and eight of these have been allotted to control of street lighting, shop window lighting and water heaters. Four spare signals were consequently available to operate relays placed in the trip circuits of the feeder switches to be opened but this number was not enough for these to be used direct.

To increase the number of distinctive operations that could be performed, the manufacturers have produced special relay units each of which uses two normal signals to operate it. Thus by taking advantage of the fact that mathematically the number of different combinations of four things taken two at a time is twelve, the number of distinctive operations can be increased considerably.

Sequential Operation

The transmitter provided can only send one signal at a time and consequently the two signals have to be sent sequentially within a short time of each other. The special relay units are arranged so that the first signal acts as a "gate" and operates a normal type relay element to close a circuit containing a thermal switch, After a short delay the thermal switch closes the circuit for the reception of the second or switching signal which operates the second relay element and closes the tripping circuit of the circuit breakers to be opened. The thermal switch ensures that the second signal must be sent within a predetermined time interval related to the first and these features, in addition to increasing the number of individual controls available, also reduce almost to vanishing point the possibility of false operation which is most important for such an application. Since the sequential signalling does not preclude the second signal being a repetition of the first, four further operations can be performed if these additional combinations of like pairs are used and a total of sixteen distinct operations, instead of the twelve previously mentioned, can be derived from the four original signals.

These special relay units are mounted together on a board and leads and plugs are provided for plugging into sockets wired up to the trip circuits of the breakers to be opened.

Similar special relay units are used, where necessary, to lock automatic 'on-load' transformer tap changes and to restore them to automatic working, as required.

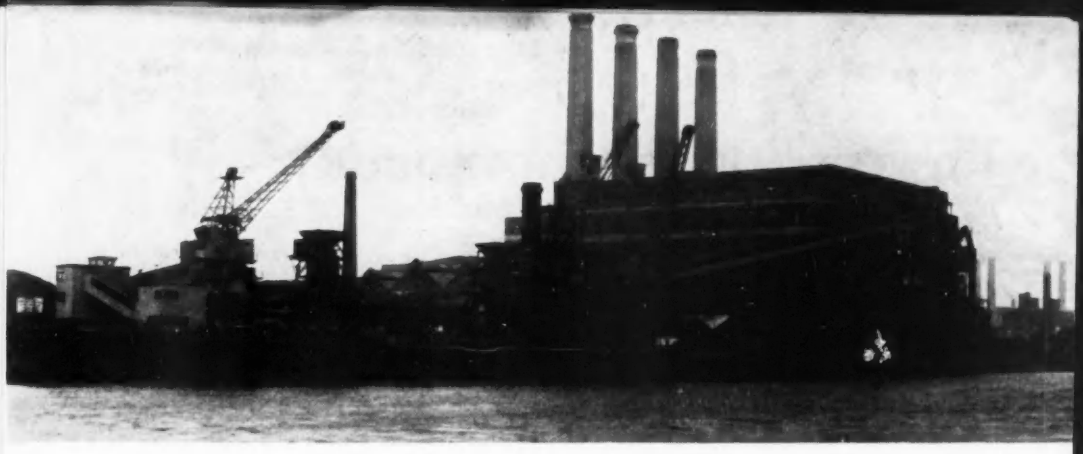
This arrangement has proved very flexible as the relay units can be plugged into the trip circuits of breakers selected to be operated on the load shed rota for the next day. This procedure can be repeated each day. Furthermore, it is possible to transport the relay units from substation to substation and plug into selected circuit breakers as desired.

The method is economical with regard to the number of special relay units required and permits the greatest possible use to be made of the number of signals available.

In operation the system has proved most successful and reliable and has enabled all requests for load shed to be complied with in less than two minutes.

ELECTRICITY SUPPLY HANDBOOK
NEW 1952 EDITION

of this Electrical Times publication is now available. The text and maps have been completely revised and enlarged and a new section has been added giving the supply voltage of the principal towns and villages in the United Kingdom. Price 5/- from the Electrical Times' Offices



New Set Commissioned at Fulham

Mayor performs Official Ceremony

SIXTH set to be added to the generating capacity of London Division's Fulham Station is a 60 MW hydrogen cooled unit, manufactured by the English Electric Company. Yesterday the set was officially commissioned at a ceremony in which Mr. H. V. Pugh, the Divisional Controller, invited the Mayor of Fulham, Councillor P. E. Fenne, to start up the turbine driving the set. After the guests attending the ceremony had been on a conducted tour of the turbine house and boiler house of the station, they assembled in the canteen for tea, when speeches were made by His Worship the Mayor, by Mr. W. C. Parker (Controller, S.E. Division, B.E.A.), a former Borough Electrical Engineer of Fulham, and by Sir John Hacking, Deputy Chairman of the British Electricity Authority.

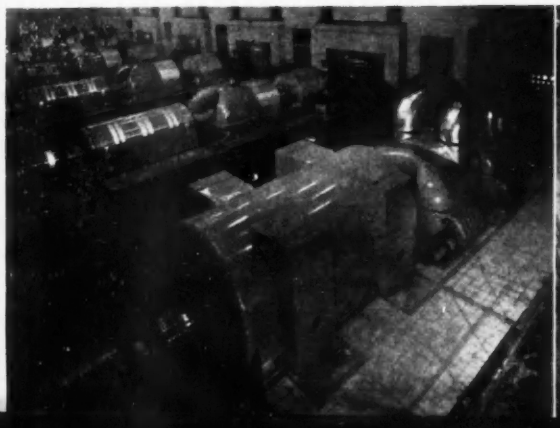
This new set differs in several important particulars from the five other 60 MW units installed in this station. It is a 2-pole, 3,000 r.p.m. machine, whereas the others are 1,500 r.p.m. design. Because of its higher speed, its exciter is driven through gearing instead of being direct coupled as with all the other sets.

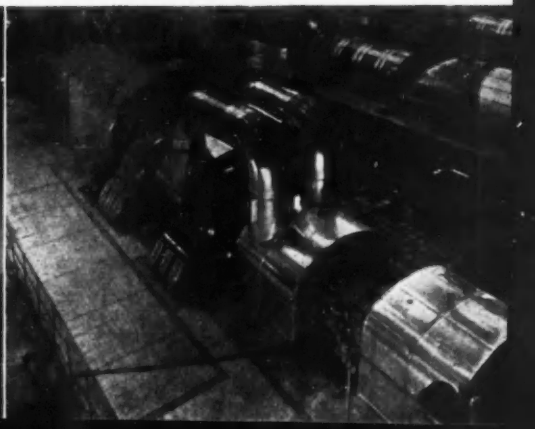
On the steam side, provision is made for ultimate conditions of 900 lb/sq in., 900° F, but for the present it is to work at the main station conditions of 600 lb/sq in., 800° F at the turbine stop valve. It is intended that eventually the existing station boilers will be replaced by units suitable for the higher steam conditions. To allow of its modification, the turbine has been built as a three-cylinder unit, and the set is accordingly longer than the earlier generators installed in the station.

Station Modifications

To enable the new set to be accommodated, a 10 MW house generator, which had become largely redundant under present-day operating conditions, was removed. Some other modifications to the station layout were necessary, including the provision of a second screen house at the river intake to increase the circulating water intake capacity. The new screen house will be of general advantage to the operation of the station during autumn months, when choking of the screens due to blockage by leaves sometimes causes trouble.

Views of the electric and steam ends of the new set emphasise its difference from the other Fulham units





Power Station Economics

Effect on Design of Increasing Unit Sizes

A RECENT paper presented to the I.E.E. by BRYAN DONKIN and P. H. MARGEN, dealt with the optimum size and boiler turbine arrangement for the British Grid system. The conclusion arrived at by the Authors was that sets of 100 MW or over working on the unit system and with a steam tie-bar boiler connection were the most satisfactory arrangement both from the economic and operating viewpoint. This analysis took into consideration such items as plant availability, outages, size of connected load and the effects of electrical interconnection.

Further information on the subject of large machine economics has now been published in a recent issue of *Electrical Engineering* where the power-station economics alone are discussed. This paper, by J. B. McClure and A. G. Mellor, deals, of course, with American practice, and does not consider the economic factors involved by external connection in the detailed manner adopted by Donkin and Margen. Nevertheless, the conclusions are of interest as indicating modern American trends.

The development in America in past years, of the integrated power system with a backbone of high-voltage transmission circuits, led to the concentration of power generation at a few favourable locations. The natural increase in system loads, which has resulted in the doubling of system peaks every eleven years, led to the use of increasingly larger units. Interconnection between systems to take advantage of peak load diversity and high capacity interconnection between adjacent systems emphasised this trend. Now a situation has been reached where the economics of large unit systems require careful investigation.

The cost per kilowatt of turbine generator capability decreases as the size of unit increases. This can be seen from the curves in Fig. 1 where the solid line is for steam conditions of 1,250 lb/sq in. and 950° F. The dotted curve above is for steam conditions of 1,800 lb/sq in. and 1,050° F and shows a greater downward slope while the uppermost curve is for the same initial conditions, but with reheat to 1,000° F, and has an even greater slope. These curves are for single alternator units: at 3,600 r.p.m. when sizes above 100 MW are considered, both 1,800 r.p.m. and cross-compounded units are available, and although these are somewhat more costly, they show a continued downward trend in cost with increasing size, the cross-compounded units being more pronounced. With one boiler/set, the curves of costs for boilers would show a similar trend.

Design Features

It should be recognised that 3,600 r.p.m. units are not used universally over the range 10-200 MW. In the region over 100 MW, many users purchase straight 1,800 r.p.m. units or cross-compounded units. The 1,800 r.p.m. sets have larger exhaust areas, and thus give improved economic running where cooling water temperatures provide a good vacuum. These straight 1,800 sets, however, become more expensive at the higher steam temperatures because of the bulk of high temperature material which has to be used. Present-day design considerations have, therefore, limited the selection of 1,800 r.p.m. units to steam conditions of

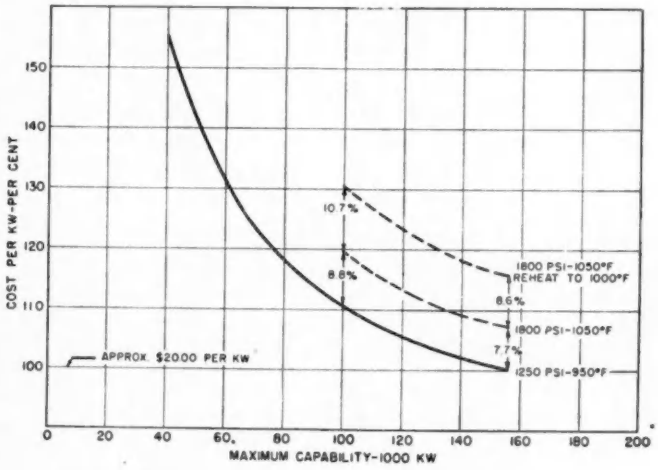


Fig. 1. Curves showing relative costs with machine size

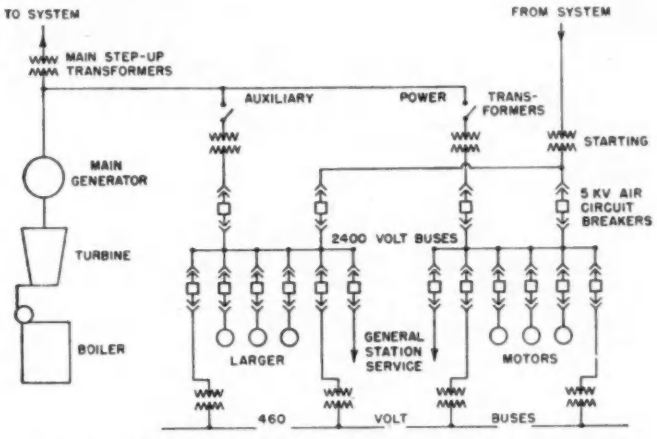


Fig. 2. The method of connection of auxiliaries on a unit system large machine is shown here

1,450 lb/sq in. and 1,000° F or below. The most effective combination in the larger sizes, which is still more expensive is the cross-compounded set with a 3,600 r.p.m. h.p. unit and with a 1,800 r.p.m. l.p. unit. However, the choice of machine made depends on the evaluation of efficiency, fuel cost, cooling water temperature and expected load factor.

Reverting to the 3,600 r.p.m. unit with fixed steam conditions it has been found that over the whole range in size between 40 and 160 MW there is a change of not more than 2% in the heat rate. The conclusion can, therefore, be drawn that for fixed steam conditions and the same design speed there is little increase of efficiency made by increasing the set size.

A point, however, sometimes omitted in economic computations on plant sizes is that the number of men required to operate a unit in a station is practically independent of the size of unit.

Generators

Although the design of turbine is of considerable interest, the generator coupled to it is of major importance. From the standpoint of the main power circuits in the station, the 1,800 r.p.m. alternator offers the greatest flexibility. It may be designed as a 1-, 2-, or 4-circuit machine and by using two sets of bushings on a large hydrogen cooled (0·5 lb/sq in.) 4-circuit machine, current outputs in the neighbourhood of 10,000 amps. at 15 kV are practicable. In certain applications where power is distributed at generator voltage, double winding generators have been built with each half of the generator connected to a different bus section. The object of this is to reduce switchgear short circuit ratings. Difficult ties, however, arise in dealing with unbalanced loading and special design is needed.

As generator sizes increase, it becomes more difficult to design for the standard output voltage of 13·8kV. Since however, almost all very large generators are directly connected to step up transformers, there is no reason why any new generator voltage should be considered standard. The designer should be given free choice so that selection of the voltage will result in the most economical design.

Again, as the 3,600 r.p.m. alternator size goes above 100 MW, the current to be carried by the field windings, slip rings, field circuit breakers and exciter commutator becomes excessive if 250 volts is used. Therefore, generators above this size should have 375 volt fields to reduce copper cross section and high current duty on ancillary equipment.

Main power connections also begin to present difficulty in the larger sizes. The high currents, up to 5,000 to 6,000 amperes require several cables in parallel per phase for the connection between the generator tail-ends and the generator transformer. Terminations for this type of cable run are expensive and these important connections represent a potential source of trouble. An isolated-phase bus run of carrying capacity up to 7,000 amperes has therefore been developed which offers increased reliability and lower maintenance costs. Tap-offs for the auxiliary power transformers, potential transformers, surge protective capacitors and lightning arresters, can be readily provided with complete phase isolation throughout.

Although this method is more expensive than cables, it is being increasingly accepted, particularly for short runs. In most stations the length of run can be kept to a minimum by locating the generator transformers immediately outside the station wall.

Practical sizes of 3-phase transformers are limited by shipping requirements, and generators are being built which exceed the kVA rating of the largest transformers. In such cases, two or more 3-phase transformers,

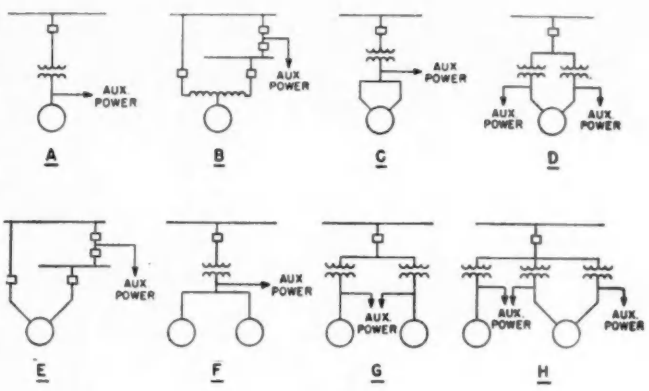


Fig. 3. Typical connections for large units. (A) Single-winding generator; (B) single-winding generator with duplex reactor. (C) two-bushed generator. (D) double-winding generator; (E) alternative for double-winding generator; (F) cross compound direct coupled; (G) cross-compound set bus on h.t. side; (H) cross-compound with double-wound generator on l.p. turbine

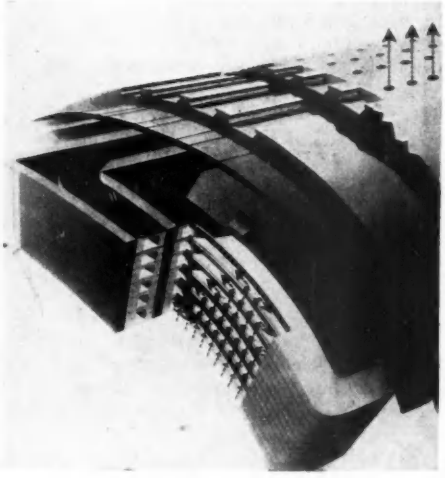
operating in parallel and connected to the high-voltage system through a single circuit breaker or, alternatively, three single-phase units can be used. To reduce the physical size of transformers, it has become common practice to use forced cooling. As more intensive types of cooling are used not only the size but the first cost diminishes.

General Station Design

With the development of the larger generating set has come acceptance of the unit system. Four principal reasons can be given for this. First the reliability of the modern large set is such that interconnection can be dispensed with without sacrifice of availability; second, the operation of large sets on to a common busbar system is liable to lead to excessive fault current; third, the output of large machines cannot be handled satisfactorily at generator voltage and last, the trend to higher temperatures and reheat makes the cost of steam interconnectors and other high temperature, high pressure, equipment, excessive. The unit trend is extended to cover all auxiliaries, but again, with the very large units—over 125 MW, it becomes necessary to step up voltages used for motors, etc., to obtain satisfactory switching and protection, and in America 4,160 volts is regarded as being more advantageous. Finally, the modern trend to use centralised and automatic control also favours the large unit. This again is due to the fact that the cost of centralised control is practically independent of the size of set, and can, therefore, be justified more readily in the case of large sets.

HIGH CURRENT DENSITY ROTOR

THE illustration on the right shows the end section of a Westinghouse Corporation experimental rotor designed for forced pressure hydrogen cooling. The path of the hydrogen gas is shown by the arrows. It will be noted that although the tapered rotor slot may be difficult to machine, its use results in a much simpler blocking for the straight part of the rotor coil ends. This blocking is further simplified by the elimination of gas flow between the coil sides, and the use of a constant cross-section of copper for the circumferential portion of the rotor end turns. In this type of rotor the conductors are necessarily of large cross-section and few in number. The field current is large; field voltage low, and input about twice that for a rotor of a generator of conventional design. **A general article on this subject appeared in our issue of November 29, 1951.**



Our readers' views . . .

Wiring Direct in Concrete

REFERRING to Mr. Gilbert's letter in your issue dated February 28, 1952, I have had considerable experience with the use of Ductubes in all types of buildings.

The question of dampness in the concrete after the original drying out process is very remote, particularly in buildings of the suspended floor types. For lighting and heating circuits we use T.R.S. cables with earth wire incorporated. That entirely eliminates the corrosion Mr. Gilbert fears on the bare earth wire. The drawing in to the duct, already formed in the concrete with Ductubes, of flexible non-metallic conduit would be extremely difficult, particularly on long runs which have one or two bends, and would appear to be an unnecessary cost.

I cannot agree with Mr. Gilbert that flexible non-metallic conduits can be used in the same way as Ductube, for firstly non-metallic conduits are far more liable to damage by the concretors, strange though this may sound. The Ductube is extremely tough and behaves in the same manner as a tyre when struck with a shovel. Second, the practice of raising the reinforcement (when steel shuttering is used) shakes steel conduits, never mind non-metallic, to such a degree that often the points are completely out of position and the boxes blocked up with cement. Ductube is admirable for this type of job.

Complications do not develop on switch drops when using Ductube. The wall in any case has to be chased to house any conduit, so in the chase we lay a short end of Ductube, plaster over it and withdraw the tube when dry. This now gives you a complete duct from light to switch.

In conclusion I feel that this is a definite step forward and is of untold value to contractors in these days of acute steel shortage by showing a definite saving in labour and materials.

L. A. Evans

WESTON-SUPER-MARE

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WHAT Mr. T. C. Gilbert says in his letter about conductivity of concrete and the various chemical exudations from concrete may be true when the concrete is still fresh.

The suggestion of drawing in a flexible non-metallic conduit into the duct is precisely what is done in the "Ductube" system, as the types of cable recommended for use with "Ductube" already have their own "flexible non-metallic conduit," i.e. the sheath, and do not require an expensive additional conduit.

In order to be assured of the right type of cable to use, my company approached the Cable Makers' Association and the E.D.A., who both recommend P.V.C. or T.R.S. cables for use in conjunction with "Ductube," and we feel that we can rely on their judgment.

B. V. Cufflin
MANAGING DIRECTOR

DUCTUBE, CO., LTD.
LONDON, W.1

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I.E.E. Regulations

A CORRESPONDENT in your last issue, questions in no uncertain voice the I.E.E. Regulations, and even calls on the Wiring Rules Committee to adopt his suggestion or be gone.

The 12th edition of these rules contains twenty-three tables, covering 40 pages, and your correspondent wished to add to these another eight tables:—but why stop at eight? There are many points of greater importance that could well be covered by tables and it would be easy to bring the number up to hundreds.

Tables may be a point of doubtful utility, unless it be to a man not well up in his work, and then he may make mistakes in the application of the tables.

Take for example Table 8. Here it says that if four 19/·044 cables are drawn into a conduit the current rating must not exceed 52 amps, but for a single pair it is 65 amps. Now it might be that there were installed in the conduit four such cables, but under conditions that only one pair could be loaded at the same time. In these circumstances there is no reason why the current rating should be reduced from 65 amps, except that the table must be complied with. There is a note to Table 8, which, I take it, would permit the maintenance of the 65 amp rating, but my experience has been that users of tables rarely read the notes.

Again there is no reference to the size of conduit used—a factor that in some measure bears on the carrying capacity.

Table 23, affords another example of the use of tables. Suppose we wish to obtain a conduit suitable for four 3/·029; two 7/·044; and two

7/·052 vulcanised rubber cables. There is no direct answer to the problem given in this table, and to produce tables to cover all such points would be impracticable.

Tables are at times useful even to the expert, but are often indispensable to the man who does not really know his work. The Tables given in the I.E.E. regulations have been wisely selected, but spare us from an increase. Rather give us some basic rule such for instance (to replace Table 23) a permissible watts loss per 100 ft for each size of conduit.

F. Peake Sexton

SURBITON

The I.E.E. Annual Dinner

Emphasis Placed on Shortage of Trained Engineers

THE Annual Dinner of the Institution of Electrical Engineers, held this year at Grosvenor House, attracted an attendance of well over one thousand members and guests.

Principal guest was His Grace the Lord Archbishop of Canterbury, upon whom devolved the task of proposing the toast of "The Institution." He began by referring to the form in which his invitation to the Dinner had been couched. He thought that the idea of inviting people who were members of other professions showed a degree of humility rare in the present day. The repercussions of the electrical profession were enormous in the life of the community. He himself had for many years used an electric razor, and a great boon it had proved. Electricity however covered a wide range of human interests from the atom-bomb to the alleviation of the housewife's task. It could do so much to increase the amenities of ordinary life it was a great profession and vocation.

The I.E.E. was responsible for watching the standards of the profession. This was a great responsibility as there was sometimes a tendency for a profession to become a close corporation. This in turn could lead to over-specialisation, one of the real dangers to our civilisation. There was bound to be a certain amount of specialisation, but over-specialisation could lead to grave intellectual and even greater moral danger. Minds should be kept open and alert to the wider fields of human activities.

Need for Engineers

Replying for the Institution, Sir John Hacking thanked the Archbishop for his presence and his speech. The Annual Dinner, said Sir John, provided an opportunity for the Institution to stand back and take stock of itself. The main question we should ask ourselves is "are we fulfilling our public duties to the best of our abilities?" Two particular items immediately came to mind : exports and education. Dealing with the latter, Sir John emphasised that it was a requirement that an adequate supply of technical personnel should be available. New and diverse techniques were continuously being developed; unfortunately the entrants to the industry were not as numerous as they should be. He believed that the I.E.E. could contribute much to remedy this state of affairs. It was essential to build on existing facilities, and more intensive use should be made of those available. Technical colleges, for instance, should extend their courses.

On this subject, there was close co-operation between this Institution and the two fraternal engineering Institutions. The present form of co-operation was, he thought, the best that could be devised. This co-operation was however not confined to this country but extended to the United States, the Commonwealth and the European countries.

Power Supply

The fact that we had got through the winter without extensive load shedding had not been directly due to the plant overhaul programme, nor to the increased capacity available, nor to the kindness of the winter weather. It was mainly due to the improved methods of load spreading and to the whole-hearted co-operation of the user. We could not assume that load shedding was entirely over; the risk however should now become progressively less in succeeding winters.

The toast of "The Guests" was proposed by Mr. J. R. Beard; and Sir William J. Slim, Chief of the Imperial General Staff, replied. He pointed out that electricity and electronics were playing an increasing part in the fighting services. The greater shortage, however, was that of electrical engineers. Gear of the best quality was coming along in quantities but there was a grave maintenance difficulty. What he would ask, not the Institution itself, but those members on the manufacturing side, was to lend a hand by sparing men. He knew the Industry was short of manpower, and that he was asking a paradoxical thing, but it had to be worked out somehow.

Cooling Tower Analysis

Fundamental Theory Simplified for Practical Use

AS suitable riverside sites become more scarce and difficult in this country for power station location, the use of natural draught cooling towers inevitably increases. In fact, of the generating capacity in the post-war construction programme, nearly one-half will use cooling towers. Thus the design of towers for specified conditions assumes an increasing importance. However, the tower has to operate under a wide range of differing conditions. The ambient temperature may vary between fairly wide limits, as also may the relative humidity. Further, the circulating water temperature may be far from constant. The performance of the tower under these varying conditions is therefore of considerable interest. In evaluating this performance the paper "Performance of Natural-Draught Water-cooling Towers" by H. CHILTON, presented to a Joint Meeting of the Steam Group of the I.Mech.E. and the Supply Section of the I.E.E. last Wednesday is of considerable interest.

Basic Theory

The basic theory adopted in the paper was that due to Merkel, now known as the "total heat method", and which had been used in calculations on mechanical draught counter-flow cooling towers. The application of this method of attack to natural draught towers had not, however, been so easily undertaken due to practical difficulties in calculating the air flow. A method of evaluating this last function, due to Wood and Betts had been derived, but included constants difficult to evaluate, and also involved cumbersome arithmetic. This calculation could however be simplified and in conjunction with Merkel's method could be applied to natural cooling towers. The simplification consisted of applying information which could be derived from conventional performance tests.

An analysis of the existing test results, to evaluate these empirical constants also showed a relationship which further simplified calculation and enabled the factors to be reduced to a single number called the "performance coefficient" which was mainly a function of the depth and type of packing. By re-introducing the tower height and base cross-sectional area, a further factor was derived, termed the "duty coefficient" which defined the overall capabilities of a tower under all operating conditions.

An analysis of the basic theory showing its relation to the empirical method, together with practical measurements to illustrate the divergency to be expected was given at some length. The discrepancy at various degrees of humidity between the actual temperature of the recooled water and that given from the tower makers' charts were shown to vary from $-5{\cdot}6^\circ$ F to $+2{\cdot}3^\circ$ F, while the discrepancy using the calculation method was from $-2{\cdot}1^\circ$ F to $+1{\cdot}2^\circ$ F.

By the use of the method outlined in the paper, fixing a performance coefficient and deriving Merkel's cooling factor from a nomogram in the paper, the overall dimensions of a cooling tower for any specified duty could be derived.

In conclusion, it was stated that nearly all cooling-tower problems which arose in the design and operation of electricity generating stations and in economic studies could be solved by the method outlined from data which were readily available or which could be collected without difficulty. While the paper was not primarily intended for the cooling tower designer, it defined in simple form the effect of each of the major variables on tower capacity, and the relationship between recooled-water temperature and operating conditions.

Inconsistencies in the test results were probably due, at least in part, to the effect of variables which could not readily be taken into account, in either design or in the interpretation of the results. A single test, however well conducted, might be misleading as to the capabilities of the tower.

Performance curves did not invariably represent correctly the relationship between recooled water temperature and operating variables. A form of specification was therefore proposed, which by stipulating the performance required under all conditions, made performance curves unnecessary.

DISCUSSION

MR. I. V. ROBINSON (B.E.A.M.A.), who had written a paper on the performance and testing of cooling towers as long ago as 1907, described some of the work which he had done at that time and which led him to see the desirability of getting a figure similar to the author's performance coefficient. The author suggested that the capacity of a tower should be specified in a way which defined its performance under all operating conditions. It was doubtful whether this would be acceptable to the manufacturer, because the purchaser might attach undue importance to the conditions in which the guarantee was not met.

MR. B. WOOD (Merz & McLellan) sympathised with the author's desire to have a simple, straightforward way of treating all cooling towers, but said the danger was that it made all cooling towers alike. There was not sufficient distinction between the performance coefficients of the different forms of packing, and probably a statistician would say that the differences were hardly significant. There was danger in the supposition that cooling tower results should plot on straight lines. A cooling tower was not a simple thing; almost every tower behaved differently from every other, and each behaved differently under different weather conditions. Moreover, the author's theory omitted the effect of draughts created by wind.

MR. P. H. MARGEN (Kennedy & Donkin), while also expressing sympathy with the author's desire to find a simplified relation and a constant performance coefficient, said that he was, like Mr. Wood, and for the same reasons, a little suspicious of the results obtained. There appeared in certain respects to be a major contradiction between the results which the author had deduced from his tests and the results predicted from theory. Mr. Margen made certain suggestions about the causes of this and on how theory and test results could be made to agree, and emphasised the influence of the conclusions arrived at on economic design.

MR. M. G. OESTREICH (I.C.I., Alkali Divn.) referred to some tests which he had recently done on a cooling tower and said that, applying the author's method, he had under varying conditions obtained figures varying from 5.5 to 6.7 for the author's performance coefficient.

MR. E. T. L. EMERY suggested a different form for the author's performance coefficient C, and said that $1/C^3$ raised to any convenient power of 10 might be a preferable factor, to C itself.

MR. P. BETTS (Merz & McLellan) agreed with the author, that a single test, no matter how carefully conducted, was very misleading as to the capabilities of a tower.

The Author, in reply, said that his method, whatever imperfections it might have on the theoretical side, appeared to be fairly constant for various tests on a given tower. It was not a prediction; it was merely a statement in convenient form of actual experience. The only assumption which had to be made was that other water-cooling towers would behave in a similar way to the ones which had been tested.

New Standards for Meters

FOR some time now the British Standards Institution has been engaged on a comprehensive revision of B.S.37, which applies to electricity meters. The first two parts of the new document were published last week and further sections are promised. Parts 1 and 2, which are printed together, deal with general clauses applicable to all types of motor meter, and with single-phase, two-wire whole current credit type meters. Parts to come will deal with prepayment meters, polyphase meters, kW demand meters, transformer operated meters, d.c. meters, portable meters and precision meters.

In the course of the revision, alterations have been made in the system of rating and in the number of ratings of single phase two-wire whole current meters. Standard marked current ratings are now 10 amp, 40 amp and 80 amp, the marked current being the maximum that the meter is to be required to carry. Power losses in the meter voltage circuit are varied from 2·0 watts below 240 V to 3·0 watts above 250, and in the meter current circuit at 3 watts for all ratings.

Errors

In the foreword to the standard it is stated that owing to the world-wide shortage of materials prevailing at present, certain limits of error are greater than would otherwise have been specified. The actual errors permitted for single phase meters at marked voltage, 50 c/s and standard temperature (15°C) are ± 2%, for a unity power factor load from 1/60 marked current up to full marked current, and + 2%, —2·5% at 0·5 lag p.f. from 1/30 marked current up to marked current. It is required that the rotor shall start and continue running when the meter carries 0·25% of the marked current at minimum marked voltage, unity power factor. To ensure compliance, it is recommended that the torque developed at marked voltage, marked current and unity power factor should not be less than 10 gram-centimetres.

A variation of ± 10% in voltage at any current from half marked current down to 1/10 marked current, at unity power factor, is required not to cause a change of more than 1% in the error of the meter. The temperature co-efficient of the meter is to be less than 0·1%/degree Centigrade. With reference to frequency, the effect of a ± 5% change in frequency is required to affect the meter by not more than 0·75% for 1/10 marked current, u.p.f.; 0·75% for ½ marked current, u.p.f. 2·0% for ½ marked current 0·5 p.f.

Meters are to be designed to carry overloads of 200 amp (10 amp meter), 400 amp (40 amp meter), and 600 amp (80 amp meter) without permanently impaired accuracy. A 2° change in level of the meter in any direction shall not affect its accuracy by more than ± 1% at ½ marked current u.p.f., or more than ± 2% at 1/60 marked current, u.p.f.

Appendices to the standard set out test procedure and other details, and the body of the standard deals also with dimensions and with adjustment and design. Copies of the standard, price 4s., can be obtained from the B.S.I. Sales Department, 24 Victoria Street, London S.W.1.

EARTH FAULT CURRENT

determined on the D.C. Network Analyser

By A. SALZMANN, DIPL.ING., A.M.I.E.E.

THE main purpose of the d.c. calculating board of the resistance type is the determination of symmetrical 3-phase fault current in large interconnected networks. However, if the unsymmetrical fault current (such as line to earth fault current in networks with low-resistance earthed-neutral) exceeds the 3-phase short circuit current, the d.c. network analyser will fail to give the correct answer, and the breaking capacity rating of circuit breakers based on the lower short circuit value may be inadequate.[1]

The proof that a single line to earth fault current can be larger than the 3-phase short circuit current is established by comparing the well-known furmulae

$$I_F = E/Z_1 \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$I_F^1 = 3E/(Z_1 + Z_2 + Z_0) \ldots . (2)$$

where I_F = the 3-phase symmetrical fault current, I_F^1 = the line to earth fault current. E = the phase voltage of the system prior to the fault and Z_1, Z_2, Z_0, the positive, negative and zero phase sequence impedances expressed in ohms and referred to the rated system voltage of the faulty section.

For practical purposes it is justifiable to assume that $Z_1 = Z_2$ hence according to eq. (1) and (2) the 3-phase and line to earth fault current are identical if $Z_1 = Z_0$; the line to earth fault current is larger than the 3-phase symmetrical fault current if Z_0 is smaller than Z_1 (i.e. fault location close to the source of supply), and smaller if Z_0 is larger than Z_1 (i.e. fault location remote from the source of supply).

From an inspection of equation (2), it follows that the line to earth fault current is

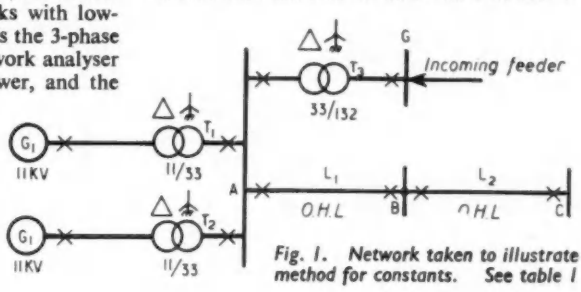


Fig. 1. Network taken to illustrate method for constants. See table I

obtained on the d.c. board if each resistor representing the positive sequence network set up for 3-phase short circuit values is increased to twice its value, and if this modified board representing positive and negative networks is connected in series with a second d.c. calculating board representing the zero phase-sequence network.

A more simple method has been suggested by Messrs. Monseth and Robinson[2]. Considering again equation (2), and substituting for $Z_1 = Z_2$ and dividing numerator and denominator by two we obtain

$$I_F^1 = \frac{(3/2) \times E}{Z_1 + (Z_0/2)} \quad \ldots\ldots\ldots\ldots\ldots (3)$$

From this equation it follows that the line to

TABLE I

Units	MVA	Rated voltage kV	% Impedance	% Impedance referred to * 100 MVA base	Positive phase sequence impedance (ohms)		Zero phase sequence impedance (ohms)	
					Actual values referred to 33 kV	Board values	Actual values referred to 33 kV	Board values
Fault level at G	200	132	—	50·0	5·46	500	—†	—
G_1 G_2	30	11	15	50·0	5·46	500	—	—
T_1 T_2	30	11/33	10	33·3	3·64	333	3·64	$\frac{1}{2} \times 333$
T_3	30	132/33	10	33·3	3·64	333	—	—
L_1	—	33	—	30·5+j79·6	3·34+j8·72	852	11·7+j30·5	$\frac{1}{2} \times 3·5 \times 852$
L_2	—	33	—	20·9+j53·0	2·29+j5·80	568	21·8+j20·3	$\frac{1}{2} \times 3·5 \times 568$
1	2	3	4	5	6	7	8	9

* It is assumed that the resistance is negligible except for lines L_1 and L_2.
† For faults at location A, B and C, zero phase sequence component is zero.

earth fault current can be easily determined if

(a) The network analyser set up for 3-phase short circuit values and representing the positive sequence network remains unaltered.
(b) A second d.c. board, representing the zero sequence network whose resistors are set-up to one-half value of each branch, is connected in series with the positive phase sequence network.
(c) The d.c. board voltage is increased by 50%.

However it is not necessary to increase the network analyser voltage, as the same voltage can be used for both 3-phase symmetrical and line to earth faults but the ammeter readings for line to earth faults have to be multiplied by 1·5.

Thus any d.c. network analyser designed for calculating 3-phase symmetrical short circuit currents can be utilised in conjunction with a second small board for determination of line to earth fault currents.

It must be emphasised, that the analyser does not take into consideration differences in impedance angles of various system elements, because the a.c. quantities representing the network components are added algebraically and not geometrically.

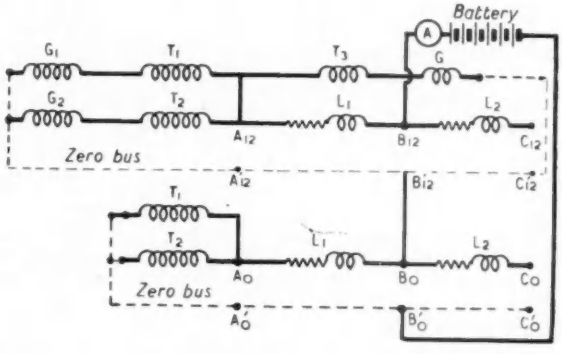


Fig. 2. Sequence networks and their connections for a line to earth fault at location "B" for the circuit shown schematically in Fig. 1

It is obvious that the setting up of two independent networks representing the in-phase resistance component and the quadrature reactive component of each circuit element, will increase the accuracy of the quantities measured on the d.c. board, but it is questionable whether the setting up of two separate network analysers is a practical proposition if the network under consideration is complicated and contains a number of supply sources.

As a general rule, if the ratio X/R is high the reactance of the circuit elements is used in setting up the d.c. board (i.e. generators and transformers), if however the resistance is large as compared with the impedance (i.e. overhead lines) the impedance value should be taken into account in setting up the network.

Consider part of a large interconnected network as shown in Fig. 1, where the circuit constants are tabulated in Table 1. The generators and transformers are represented by reactances and the overhead line by impedances and we realise when comparing the calculated values with the measured a.c. quantities, the error is negligible. (Compare columns 7 and 14 in Table 2.)

However it should be borne in mind, that the accuracy of the result depends mainly on the accuracy of the data of various circuit elements used for setting up the analyser.

TABLE 2.

Fault location	Type of fault								Type of fault					
	Three-phase					One phase to earth			Three-phase			One phase to earth		
	By calculation								Measured values expected on d.c. network analyser*					
	Accurate		Inaccurate			Accurate	Inaccurate	Error	D.C.	A.C.		D.C.	A.C.	
	Current amps	MVA	Current amps	MVA	Error %	current amps	current amps	%	current mA	current amps	MVA	current mA	current amps	MVA
A	6,300	359	6,300	359	0	7,300	7,300	0	179·5	6,300	359	208	7,300	416
B	1,570	89·5	1,555	88·5	0·960	982	975	0·72	44·2	1,550	88·4	27·8	975	55·7
C	1,040	59·4	1,030	58·8	0·965	619	616	0·485	29·4	1,030	58·8	17.5	616	35.4
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

* Assuming network constants remain unchanged when inserting d.c. milliammeters at various locations.

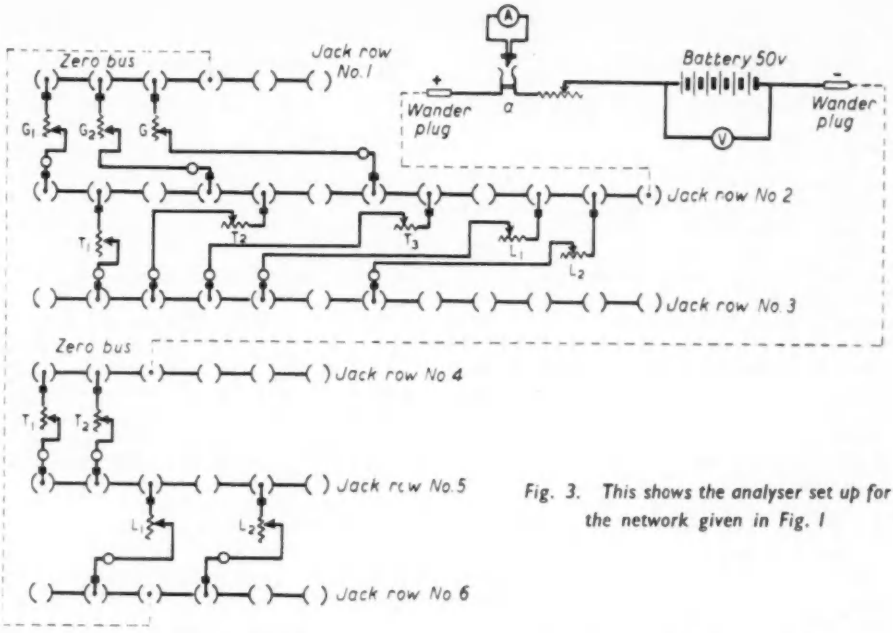


Fig. 3. This shows the analyser set up for the network given in Fig. 1

Setting up the D.C. Analyser

The method of determining of fault currents on the d.c. board is based upon Thevenin's Theorem applied to symmetrical component analyses.[3] The line to earth fault current is obtained according to equation (2) by placing the battery in the artificial earth fault path, thus connecting the positive and zero phase sequence networks in series. This is illustrated in Fig. 2 for the circuit shown in Fig. 1.

The network analyser having the same characteristic as the actual system is set up as Fig 3, say for a fault at the location "B". The ohmic values of the adjustable resistors representing various circuit elements such as generators, transformers and overhead lines are chosen arbitrarily and they must be high in relation to the internal resistance of the ammeter, in order not to change the conditions in the network when this meter is inserted in any circuit by a plug engaged with a jack.

The constants of the board are derived as follows, assuming 100 MVA base and 50 volts d.c. is applied to the analyser.

From the formulae for 3-phase short circuits MVA = Base $\times$ 100/Z% ... ...(4) follows that 100% impedance corresponds to 100 MVA. The resistance of the resistors corresponding to the impedance marked 100% is selected arbitrarily, say 10 times larger, hence the constant of the d.c. board is

$$I_{DC} = \frac{50 \times 10^3}{100 \times 10} = 50 \text{ mA}$$

Thus a reading of 50 mA on the low resistance milliammeter scaled say 0-500 mA is equivalent to 100 MVA (100% impedance, with respect to 1,000 ohms), and each division represents 2 MVA. This d.c. current is equivalent to $(100 \times 1{,}000)/(\sqrt{3} \times 33) = 1{,}753$ amps a.c. current for faults on the 33 kV network, hence the ratio $(I_{AC}/I_{DC}) = 1{,}753/0{\cdot}05 = 35{,}100$ and $I_{AC} = 35{,}100 \times I_{DC}$. In similar manner the ratio of I_{AC}/I_{DC} can be obtained for various system voltages. For a fault on the 11 kV network the ratio $I_{AC}/I_{DC} = 68{,}400$.

Let us consider a 3-phase symmetrical fault at location "A". The analyser is set up according to Fig. 3, but notice that units L_1 and L_2 are removed from the positive sequence board, the positive terminal of the battery is connected to jack row No. 1 and the negative terminal of the battery to jack row No. 3. The d.c. milliammeter inserted in jack "a"should then read

$$I_{DC} = \frac{50 \times 10^3}{A} \text{ mA}$$

$$\text{where } A = \frac{\frac{1}{2}(G_1 + T_1) \times (G + T_3)}{\frac{1}{2}(G_1 + T_1) + G + T_3} \quad \ldots . (5)$$

Substituting the values given in Table 1 we obtain A = 278 ohms and $I_{DC} = 50 \times 10^3/278 =$

179·5 mA corresponding to 359 MVA (1 mA = 2 MVA).

Fault current : $I_{AC} = 35{,}100 \times 0{\cdot}1795 = 6{,}300$ amps.

Check: Resultant positive phase sequence reactance at location "A" (See Fig. 2).

$$= \frac{\frac{1}{2}83{\cdot}3 \times 83{\cdot}3}{\frac{1}{2}83{\cdot}3 + 83{\cdot}3} = 27{\cdot}8\%.$$

Substituting this value in eq. (4).

$MVA = 100 \times 100/27{\cdot}8 = 359$.

Fault current : $I_{AC} = 359 \times 1{,}000/(\sqrt{3} \times 33) = 6{,}300$ amps which agrees with the value obtained on the board.

For a line to earth fault at location "A", the analyser is set up according to Fig. 3. Connect the positive terminal of the battery to jack row No. 3, jack row No. 1 to No. 5, and the negative terminal of the battery to jack row No. 4.

The d.c. milli-ammeter inserted in jack "a" should read

$$I_{DC} = 50 \times 10^3/C \text{ where } C = A + \tfrac{1}{2}\left(\frac{T_1 \times T_2}{T_1 + T_2}\right) =$$

$278 + \frac{1}{2} \times \frac{1}{2} \times 333 = 361{\cdot}5$ ohms.

(See Table 1, cols 7 and 9). Substituting for $C = 361{\cdot}5$ ohms we obtain $I_{DC} = 50 \times 10^3/361{\cdot}5 = 138{\cdot}5$ mA, hence actual d.c. current $I'_{DC} = 1{\cdot}5 \times 138{\cdot}5 = 208$ mA, this value corresponds to 416 MVA (1 mA = 2 MVA). It is of interest to note that the short circuit value for a single line to earth fault is larger at location "A" (416 MVA) than the 3-phase symmetrical short circuit value (359 MVA).

Fault current: $I_{AC} = 35{,}100 \times 0{\cdot}208 = 7{,}300$ A.

It is obvious, for a fault near the power station with direct earthing of the neutral, the line to earth fault current exceeds the symmetrical 3-phase short circuit current. However, the line to earth fault current, consequently the breaking capacity rating of circuit breakers can be reduced considerably if "Half Direct Earthing" of a network is adopted. This is achieved by earthing the star point of one transformer only, thus the zero phase impedance of the network is increased and the earth fault current decreased—a practice well established on the Continent.

In case of resonant earthed networks the earth fault current near or remote from the power station will not exceed the 3-phase short circuit current provided the arc suppression coil is continuous rated.

Check: Total positive phase sequence reactance: (See Fig. 2).

$X_1 = X_2 = \frac{1}{3}(G_1 + T_1) = \frac{1}{3}(5{\cdot}46 + 3{\cdot}64) = 3{\cdot}03$ ohms (See Fig. 1 and Table 1).

Zero phase sequence reactance:

$X_0 = \frac{1}{2}T_1 = \frac{1}{2} \times 3{\cdot}64 = 1{\cdot}82$ ohms. Substituting these values in eq. 2 we obtain

$$I_F{}^1 = \frac{3 \times 33{,}000/\sqrt{3}}{3{\cdot}03 + 3{\cdot}03 + 1{\cdot}82} = 7{,}300 \text{ A}$$

which agrees with the value obtained on the analyser.

In similar manner we can determine the fault current at location "B" and "C". (See Table 2). Notice Fig. 3 illustrates the connections for a fault at the location "B".

Finally, it should be borne in mind that the analyser also enables voltages to be measured with sufficient accuracy. These voltages are required for relay performance.[4]

REFERENCE

[1] A. Salzmann: "Circuit-Breaker Ratings," *Electrica Times*, Jan. 25, 1951.

[2] I. T. Monseth and P. H. Robinson. "Relay Systems Theory and Application," McGraw-Hill Book Co., U.S.A.

[3] A. Salzmann: "Unsymmetrical Faults on Networks Distribution of Electricity," March, 1951.

[4] C. A. Asbury: "System Voltage and Fault Currents Determined Easily on D.C. Board," *Transaction A.I.E.E.*, Vol. 63. April, 1944.

HYDRO BILL IN COMMITTEE

AFTER an unexpectedly long debate, the committee stage of the two-clause Hydro-Electric Development (Scotland) Bill was completed in the House of Commons on Thursday last.

When the Committee continued its adjourned debate on Tuesday of last week (see ELECTRICAL TIMES, February 29, p. 381), Mr. Henderson Stewart, the Joint Under-Secretary of State for Scotland, continued his reply to previous speakers. He dismissed suggestions that the North of Scotland's H.E. Board's contractors were paying workmen engaged on the construction of the schemes extravagant wages, and then went on to criticise Mr. Nabarro's statements earlier in the the debate. The Board, he said, had up to the present been financed entirely by the Scottish banks, and had cost the taxpayer nothing. Both in regard to capital costs and coal-saving, he quoted figures to refute those that had been suggested. With regards to the excess of finished price over contract price, the Board worked on a fixed contract price subject to increasing costs of wages and materials.

A later speaker in the debate criticised Mr. Nabarro's argument for leaving out of account the lower running costs of a hydro scheme as compared with its thermal equivalent. This same Member also raised again the question of technologists on the Board, contending that this was no reasonable criticism of its present constitution.

Subsequent speeches, both on the Tuesday and the following Thursday, were largely concerned with making party political points.

At the end of the debate the amendment on which it was held—that the borrowing power of the Board be increased by £10 m. only, instead of the £100 m. proposed in the Bill—was defeated on a division by 32 votes to nil.

Boiler Deposit Investigations

Fuel Research Station Report gives Details

IN the third of their recent publications which aim at bringing the record of their activities up to date, the Fuel Research Board and the Director of Fuel Research cover the period from April 1, 1949, to December 31, 1950. One of the most interesting subjects discussed is that of deposits on boiler surfaces, on which investigations were conducted for the Boiler Availability Committee.

The report confirms that there is little doubt that increasing use of p.f. firing and the application of improved methods of on-load and off-load cleaning are reducing the time during which boilers are out of commission. Evidence obtained on visits to generating stations confirmed earlier conclusions that it is volatile compounds of alkali metals, sulphur and phosphorus which are primarily responsible for the formation of deposits, but it is considered as now evident that the extent of the trouble caused by these constituents may be greatly modified by boiler design and operation.

At a station (retort stokers) where phosphatic deposits gave trouble, auxiliary firing of a part of the coal in pulverised form above the fuel bed was found to give considerable improvements. Recirculating some flue gas through the fuel bed was also found to help, though the deposit. obtained with recirculation had increased concentrations of phosphorus compounds. At another station a special type of chain-grate boiler was giving good availability, although burning large proportions of coal with a high salt content. It was found when the flue dusts of this boiler were analysed, that a considerable proportion of the alkali material volatilised from the fuel bed was passing through in the form of an aerosol.

P.F. Deposits

An examination was made of deposits in boilers fired with pulverised fuel to help decide on the extent to which they may be regarded as immune from serious trouble, confirmed that corrosion and deposits occurred to a smaller extent than with stoker-fired boilers burning similar coal. Bonded deposits were found to some extent, however, and although the extent of their formation was not usually sufficient to make them a serious factor in reducing availability, it was decided that it cannot be assumed that very salty coals can always be burnt as pulverised fuel without giving trouble.

One type of deposit found in p.f. fired boilers consists mainly of sintered fly-ash, and this appeared more prevalent in boilers in which steam was superheated to higher temperatures than usual. It is quite distinct both from the alkali-bonded deposits and from the fused-ash type of deposit formed due to a high rate of heat release. Investigations suggested that these sintered deposits were composed of spherical particles of fly-ash, which had solidified before reaching the heating surface, but had afterwards undergone a surface sintering which was possibly promoted by the presence of traces of alkali salts.

Evidence collected on troubles likely with oil firing suggested that sulphur, alkalies and vanadium compounds were likely to be concerned in corrosion and deposits. Up to 58% of vanadium pentoxide was found in deposits from oil-fired boilers.

Trials carried out on generating station boilers suggested that even if a coal was not ideally suited for use in a stoker-fired boiler, the advantages of operating with a single coal outweighed the disadvantages associated with its characteristics.

Gas Turbines

Experimental work on gas turbines during the period under review concentrated mainly on the development of combustion chambers for burning coal. A vortex combustion chamber and a straight-through construction chamber were constructed, and these are described in some detail in the report. Each chamber is capable of burning 500 lb/hr of pulverised coal at atmospheric pressure. A third combustion chamber, of the cyclone type, and designed to operate on granular fuel was being developed by the British Coal Utilisation Research Association under a D.S.I.R. contract.

Investigations on the fouling of gas turbine blades by deposits from the combustion of residual fuel oils were carried out both by the Fuel Research Station and the National Gas Turbine Establishment. Spectrographic methods of examination were applied to evaluate severity of scale formation, and much information was obtained concerning the

vanadium compounds that cause fouling, their formation and their relation to the constituents of the blade alloy.

Domestic Heating

Much of the work carried out by the Fuel Research Station on domestic heating has already been noted in these columns. Much of the station's work in this field was concerned with giving direct design advice to manufacturers of solid fuel appliances. In the experimental field, there were important developments in instrumentation for radiometry in connection with domestic heating appliances. The technique of using the station's calorimeter building was the subject of tests which proved promising for future work.

Other Subjects

With the co-operation of the N.C.B., a survey was commenced on the quantity of germanium in a representative selection of British coals. No exceptionally high contents of germanium had been encountered by the end of the period reviewed, the range being 0·0001% to 0·002%, with 61% of the values being between 0·0004 and 0·001%.

Underground gasification of coal attracted considerable attention, and laboratory work on large blocks of coal (up to 17 cwt) were conducted as a means of measuring air flow between boreholes, and investigating combustion conditions. In one test air was supplied at 500 to 800 cu ft/hour through a ½ in. diameter pipe, impinging on a burning coal face at one end at a linear velocity of about 150 ft/sec. The gases obtained passed through a crack along a bedding plane, and at the other end of the 3 ft 6 in. by 2 ft 6 in. by 2 ft 6 in. block of coal a gas containing 19% CO and a calorific value of 140 B.Th.U./cu ft was obtained for nearly 24 hours.

At the end of 1950, some 106 organisations were cooperating with the Fuel Research Station in the investigation of atmospheric pollution. Interest amongst local authorities was widespread, and extension of the work was anticipated. Further surveys were in progress to obtain information on the incidence of pollution by sulphurdioxide in the vicinity of electricity generating stations.

The report is published by H.M. Stationery Office under the title "Fuel Research, 1949 to 1950," and costs 2s. 6d.

FIREGUARDS TO BE COMPULSORY?

PROHIBITION of the sale of certain heating appliances without effective fireguards is the object of the Bill published last week which Mr. Bullard, M.P. for Norfolk, South West, hopes to introduce into the House of Commons as a private member's measure. The first clause of the Bill would make it an offence to offer for sale any gas fire, electric fire or oil heater which is not fitted with a suitable guard. Exceptions would be cases in which the sale was not attempted in the course of business, or in which it was believed that the appliance in question would not be used anywhere in Great Britain.

Letting under a hire purchase agreement would similarly constitute an offence, though exemption would apply in cases where the hire-purchase arrangement began before the Bill became law.

Inspection

The Bill seeks to put responsibility for the testing and inspection of appliances on local authorities. Provision is made that a local authority would be able to authorise in writing any of its officers to inspect and test appliances required by regulations to be fitted with guards. Any person so authorised would have the right to inspect and test any such appliances kept on any premises in the area of the local authority concerned for the purpose of being sold or let under hire-purchase. Anyone who wilfully obstructed such an authorised officer would be guilty of an offence under the Act, and anyone guilty of any offence would be liable on summary conviction to a fine not exceeding fifty pounds. Officers of companies would be made liable in certain circumstances for offences by corporate bodies.

Regulations

For the purposes of the Bill, the Secretary of State could make regulations requiring gas fires, electric fires and oil heaters to be fitted with guards. He could prescribe for the guards such standards of construction and fitting as he considered appropriate to reduce or prevent the risk of fire or injury resulting from accidental contact with or nearness to flames or heating elements. Any regulations made could prescribe different standards for guards fitted to the various types of fire, and lay down the means to be used for checking the compliance of the guards with the regulations. Regulations could contain provisions for the sale of appliances manufactured before the coming into operation of the regulations or for sale for special purposes.

Regulations made under the Bill would be exercisable by statutory instrument, and this would be subject to annulment by a resolution of either House of Parliament.

Copies of the Bill are obtainable from H.M. Stationery Office, price 3d.

Notes on Wiring by MEGOHM

Under Floor Duct Systems

Some Further Aspects

IN view of interest in my article on under floor duct systems in the ELECTRICAL TIMES February 7, I am returning to the subject to answer some points raised by correspondents in the ELECTRICAL TIMES. May I say I agree with Mr. Wickham's observation that 1 in. by 4 in. fibre ducts can be laid in a screed of a depth less than 3 in. The position here, however, is that the use of 1 in. by 4 in. fibre ducts is limited to single duct work which, of course, restricts its use as an effective under floor duct system for lighting, power and telecommunication systems in buildings. As far as I am aware, no standard two-way duct inter-sector boxes for 1 in. by 4 in. fibre ducts are available and further it appears that if such boxes were made the width of two 1 in. by 4 in. ducts side by side would present problems in installation, as a screed of say 1 in. thickness above the total width of the two ducts amounting to 8 in. would necessarily require some form of reinforcement to prevent the screed cracking, to say nothing of the possibility of the ducts being damaged by the legs of heavy fitments and furniture, etc., being dropped on the thin screed above the ducts.

Minimum Cover

Whilst it may be possible to reduce the depth of the screed slightly below 3 in. to accommodate twin fibre ducts, I am of the opinion that a depth of 3 in. is desirable and reasonable for site working conditions, bearing in mind extraneous conduits have to be installed and must necessarily cross the ducts. This depth of screed is also necessary to ensure reasonable protection and prevent cracking of the screed above the ducts.

Mr. Ronald Croft's observations are to the point and it is correct that non-metallic ducts at the present time are not in short supply and they are cheaper than steel ducts. Since information is not given as to the composition of the ducts Mr. Croft uses, I assume from the description that they are circular for carrying submain cables to distribution points. I sympathise with his observation that duct manufacturers lack enterprise in producing instructive information in respect to essential details for the use of engineers and further their representatives, in certain cases, appear to have little electrical installation training or experience and in consequence are unable to answer points that may arise in connection with duct systems for electrical services.

With reference to the use of ducts for housing sub-main cables, useful information is given in the E.R.A. Publication Reference F/T 128. In the meantime it is hoped that members of the I.E.E. Wiring Regulations Committee will have noted Mr. Croft's observations, since I believe information on the lines indicated will serve a useful purpose. In particular I have in mind catenary wiring systems, which I believe on their merit alone should be more extensively used.

In connection with the recent article "Wiring Direct in Concrete", readers will recall I made reference to this system in an article "Old and New Methods." It appears to me that this system may provide a simple method for forming under floor ducts during construction of buildings. Consideration will, of course, have to be given to the formation of suitable inter-sector boxes and a method of tapping the ducts.

The following points in connection with under floor duct systems should be kept in mind : (1) Where the disposition of ceiling outlet points is known at the time of installation, the duct layout may be arranged so that ceiling outlet points can be installed from the duct by the use of 2¼ in. diameter cylindrical steel tubes. These tubes being fitted at one end with a lip and at the opposite end with lugs at 2 in. centres to accept standard back plates. (2) Conduits may be installed from inter-sector boxes to any desired position and for interconnectors between floors, distribution boards, etc. (3) High temperature melting point bitumen should be used for jointing the fibrous ducts to the bitumastic matting. (4) Care must be taken to prevent the entry of vermin into the duct, in particular during wiring operations.

I would like to take this opportunity of mentioning that in my notes on 24 January I omitted to give the reference for some of the figures I quoted. These are from E.R.A. Report V/T109.

Progress in Production during 1951

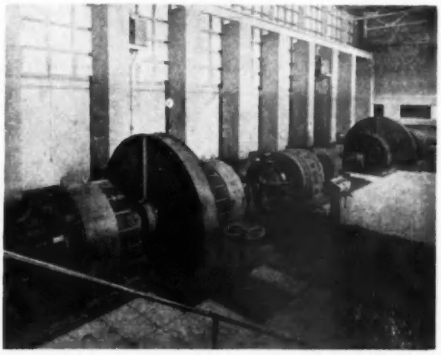
METROPOLITAN-VICKERS

AS usual, an important part of Metrovick's work in 1951 has been the provision of heavy generating plant for the British Electricity Authority. Sets for this organisation, commissioned in the year, were the third and fourth 52·5 MW units for Croydon, one of 60 MW at Battersea "B," the second of 50 MW for Poole and the first of three 31·5 MW sets at Princes Rock, Plymouth. All these sets run at 3,000 r.p.m. A 51·5 MW, 1,500 r.p.m. set has been commissioned for Clarence Dock, Liverpool.

Overseas shipments include the first of four 50 MW, 3,000 r.p.m., 33 kV alternator voltage units for Pyrmont, Sydney. To Australia, also, went the first of three 30 MW sets for the Morwell briquetting plant in Victoria. In South Africa a 30 MW unit has been delivered to the Vaal power station, where five similar units are already installed.

Orders received during the year cover more than 30 turbo-generator sets, with an aggregate generating capacity of about a million and a half kilowatts. Of these, some 20 sets totalling 1,150 MW will go to the B.E.A. The trend toward larger sizes is exemplified by three for Castle Donington, each of 100 MW, and one for Battersea "B" of the same capacity. Three 60 MW sets are for Portishead "B," two for Carrington (Manchester) and two for Chadderton (Oldham). Two sets of 52·5 MW and one of 51·5 MW are for Brunswick Wharf and Clarence Dock respectively.

The 100 MW sets for Castle Donington have many points of interest apart from their size. The turbines will be single-axis two-cylinder 3,000 r.p.m. machines for operation at 1,500 p.s.i.g., 1,050° F, the l.p. cylinders being



Two 2,480 kW Ward Leonard m.g. sets supplying a 1,680 h.p. cage winder and 3,800 h.p. skip winder at Mansfield Colliery (N.C.B.)

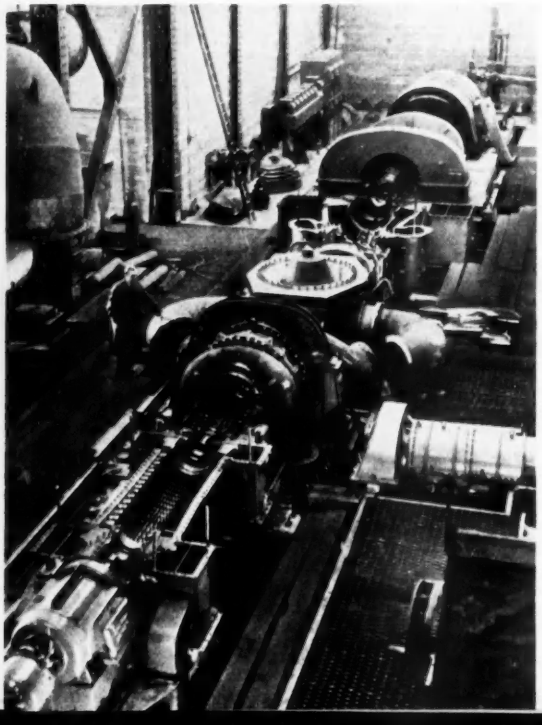
of the double flow type with a multi-exhaust in each flow exhausting to two Metrovick central flow condensers. The generators will, of course, be hydrogen cooled.

Export orders, also for 3,000 r.p.m. machines, include the second and third 30 MW sets for Morwell, Victoria, and two of 30 MW for Wilge, South Africa; two more 25 MW sets for Pasir Panjang, Singapore, two additional 20 MW sets for Umniati in Rhodesia, and another of 20 MW for the Hok Un station in Hong Kong.

The 15 MW gas turbo-generator set for Trafford (Stretford) is under erection and will be commissioned in 1952.

Hydro Plant

Some large waterwheel generators have been sent to hydro-electric stations overseas. Two are arranged for Pelton-wheel drive—the



A 15 MW gas turbine generator set being erected in the Trafford power station

second of three 14,100 kVA, 428 r.p.m. vertical shaft units for Moyar, Madras, and a third 32,000 kVA, 428 r.p.m. horizontal (double overhung) unit for Vila Nova, Portugal. Two 17,100 kVA, 600 r.p.m. generators despatched to Victoria, Australia, are, like others in hand for the Kiewa hydro-electric system, vertical shaft machines designed for drive by Francis turbines. So also are seven others in course of manufacture: three of 75,000 kVA at 214 r.p.m. for the San Esteban station in Spain, and four of 27,777 kVA at 136 r.p.m. for New Zealand. Two 16,000 kVA, 600 r.p.m. horizontal shaft Pelton-driven units are being made for Pykara, Madras.

Orders have been received for two 37,500 kVA, 500 r.p.m. and two 62,500 kVA, 428 r.p.m. horizontal shaft machines for the Aura station in Norway, and four more 17,778 kVA, 600 r.p.m. vertical generators for the Kiewa scheme, all for Pelton-wheel drive. Three 15,000 kVA, 500 r.p.m. vertical units for the Escarles Falls power station in Spain will be driven by Francis turbines.

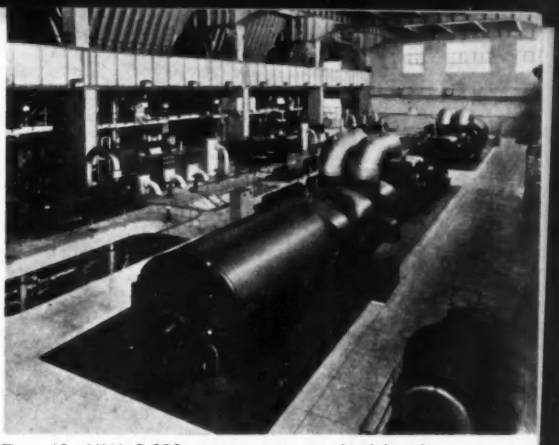
A 120 kVA, 440 V generator with fully automatic control will soon be commissioned on an experimental scheme using wind power for the generation of electricity.

Transformers

The large number of transformers manufactured or ordered during the year is so great that detailed particulars cannot be given in the space available. Among the larger sizes are the second 60 MVA generator transformer for Croydon, a 55 MVA unit for Brunswick Wharf and numerous smaller sizes for substations.

Largest among the B.E.A. orders is a 120 MVA, three-phase 13·8/145 kV generator transformer for Castle Donington; it will be equipped for on-load tapchanging in 18 steps on the h.v. winding. Four 120 MVA three-phase transformers for Carrington are to be auto-wound for a voltage ratio of 132/275 kV, and in this case will be fitted with on-load tap changing to give ±15% in 18 steps. Other B.E.A. orders include 72 MVA generator transformers for Brunswick Wharf and Chadderton.

Overseas, perhaps the most notable orders are for three 75 MVA, three-phase transformer groups, 15/241 kV for Spain.



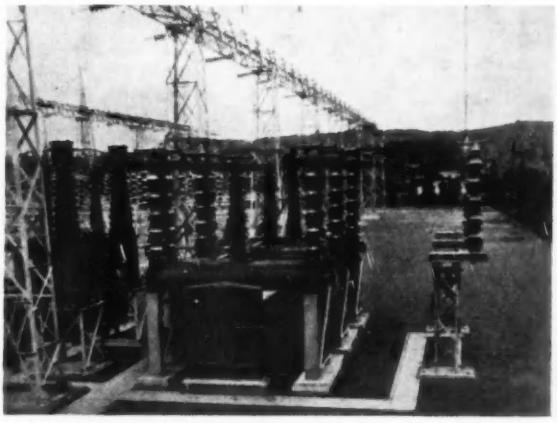
Two 60 MW 3,000 r.p.m. sets at Littlebrook running at steam conditions of 1,235 lb/sq in. 825° F (with reheating to 825° F hydrogen-cooled generators)

For systems up to 400 kV, investigations are being made on the design of generator and transmission transformers. A 275 kV outdoor current transformer of the post type has been developed with other manufacturers and a prototype constructed for use on the B.E.A. 275 kV system.

Switchgear

The heavy plant programme in this country has created an extensive demand for switchgear of all types and ratings. Among the larger installations is that for Uskmouth covering twenty-one 132 kV, 3,500 MVA air-blast breakers type GA6S for indoor mounting.

Eight newly designed air-blast breakers type GA10T6 are being made for use on the B.E.A. 275 kV system. These are rated at 7,500 MVA and give a total break time of 3 cycles. Fourteen air-blast breakers type GA6S rated at 3,500 MVA, 132 kV will go to Carrington,



Part of the 165 kV switchgear at Castelo do Bode, Portugal, showing air blast circuit-breakers and c. t.

ten to Portishead "B" and 11 to Tilbury.

Many switchgear installations are going abroad, including a 165 kV switching station with eight air-blast circuit-breakers, which has been commissioned at the Castelo do Bode hydro-electric station in Portugal. Seven 220 kV equipments are in hand for the San Esteban hydro-electric station in Spain. For the Central Railway of Brazil are seven 84 kV, 400 amp breakers, together with the control equipment for a 100 MW rectifier substation.

A new 66 kV outdoor oil circuit-breaker, type LG3, is now in production; it is a dead tank unit of exceptionally low oil volume, is designed to give a total breaking time of 5 cycles and can be shipped in one piece, requiring no adjustment on site.

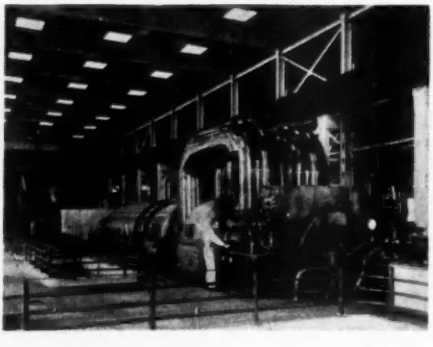
Industrial Plant

In the industrial field many large motor drives have been installed, one of particular interest being a 700 h.p., 3,000 r.p.m. synchronous motor of the turbo type. This drives a compressor in an experimental wind tunnel.

Many of the machines on order will have closed air circuits and water-cooled air coolers. Examples are a 1,550 h.p., 6·6 kV synchronous induction motor for driving a sinter fan, 1,550 h.p., 11 kV slipring induction motors, and 1,100 h.p. and 800 h.p., 6·6 kV high-torque induction motors for pumps in South Africa.

Most of the large d.c. machines, manufactured or on order, consist of motors and generators for rolling mills and mine winders. Typical of rolling mill work is a 4,000 h.p., 0/50/120 r.p.m., 800 V roughing mill motor having a peak rating of 10,000 h.p. (12,000 in emergency) and supplied from two 1,600 kW motor-generator sets with flywheels. In another plant, five motors—three of 2,000 h.p., 500 V, 300/600 r.p.m., one of 1,500 h.p., 65/135 r.p.m. and one of 1,000 h.p., 100/200 r.p.m.—are supplied from grid-controlled rectifiers.

Two 52·5 MW, 3,000 r.p.m. sets generating at 33 kV at Agecroft "B" power station



Main drives totalling 18,250 h.p. in the motor room of the tandem hot strip mill at Abbey Works, Steel Co. of Wales

Transport

The 3,000 h.p. gas turbo-electric locomotive for the Western Region of British Railways has been completed and is now undergoing trials. Some of the 58 mixed traffic electric locomotives, for which equipments were supplied to British Railways, are now in service on the first stage of the Manchester-Sheffield-Wath scheme, and electrical equipments for seven six-axle passenger locomotives are in course of manufacture. Stockton works is about to deliver its first complete locomotive, one of twenty-four 3,000 V units for the Rede Mineira and Parana-Santa Catarina lines in Brazil. Forty 3,780 h.p., 1,500 V locomotives are in hand for main line electrification in New South Wales. In the shunter class, the first of ten 3,000 V, 1,200 h.p., 68-ton units for the South African Railways is nearly complete, and one of two 1,500 V, 800 h.p. trolley locos has been despatched to Roan Antelope copper mines.

Research Equipment

The 400 MeV, 156-in. synchrocyclotron for Liverpool University is in course of erection, and the magnet will shortly be energised for preliminary tests. The equipment will include a 1,000 kW, 1,000/800 r.p.m. pulse generator driven by an induction motor. The 300 MeV synchrotron for Glasgow University has been completed and installed, and the various sections of the equipment are undergoing proving tests on site.

Electron microscopes continue in demand, and a number of general purpose and limited range mass spectrometers have been built.

Problems and Practice

IN ENGINEERING

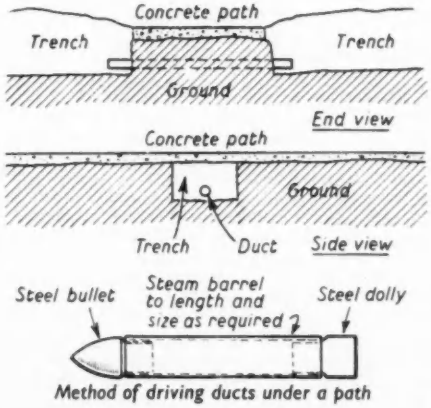
Ideas With Cables

SOMETIMES when one is called upon to lay underground cables, concrete path and roadways, as well as other obstacles are encountered which can take up a lot of time and material to cut away and make good, add considerably to costs, as well as tie up labour that can be profitably used elsewhere.

A method of ducting under such paths and roadways up to several feet in width without cutting away, and without impeding traffic, I have found useful and practicable is as follows:

Obtain a length of steam barrel large enough to take the underground cable to be used, and of the required length, shape two pieces of steel as shown in the sketch: one as a bullet and the other as a dolly. The bullet and dolly are fitted to the ends of the barrel, and either with a sledge hammer or any other force, the barrel is driven across and under the pathway. When the barrel is through, the bullet and dolly are removed and the barrel is left to form a sound and lasting cable duct.

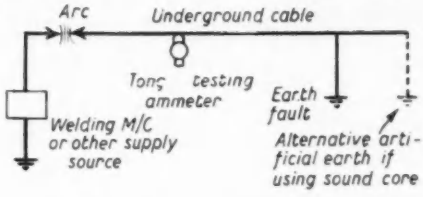
To be certain of an underground cable it is required to cut and work on, which lies along with others that are alive, the following method is useful.



Method of driving ducts under a path

If a supply such as a welding current can be obtained easily, connect as shown in the diagram and with a tong testing ammeter note the meter deflections. These will coincide with the periods at which an arc is struck and will prove without doubt which cable is required.

This has been used with equal success on cables with an earth fault, and also on sound ones, though it is obvious that on cables with



an earth fault it is essential to inject at that end of the cable, so that the tong testing ammeter would be used at a point between the earth and the injection end of the cable.—*W.T.D.*

Eddy Currents and Motors

IT is well known that armature banding wire should not present anything like a large coverage over the length of the armature stampings, as eddy currents will then cause overheating of the wire and for this reason the bands are separated and spaced over the core. It is recalled that solder on the banding wire soon ran when a 20 h.p. d.c. motor was started up on no load after rewinding the armature. It was found that a new armature winder had banded in the original spaces on the core but had continued the banding wire from one band to the other.

The rotor of a 2 h.p. 3-phase 400 V motor ran particularly hot when run light for only a short period. A rotor from a similar motor was inserted and ran without undue heating.

Investigation revealed that the squirrel cage winding of the rotor had previously been damaged and it had been decided to renew the conductors and end rings. In replacing the conductors in the slots the fitter found that the new conductors plus a thin insulating sleeve would not enter the circular slots, so he decided to open out the slots by drilling. This, of course, burred over the laminations and provided good paths for eddy currents.

Rectifying faults in armature and rotor stampings is a difficult job, and forcing off securing rings on the shafts or spiders often result in fractures.—*K. Coombs, A.M.I.E.E., Cape Town.*

overseas news

Investigations at Sydney

Now in New South Wales, Mr. J. N. Waite, lately controller of the London generating division of the B.E.A., is making an investigation of the State's power supply position. The chairman of the State Electricity Commission, Mr. Conde, said that Mr. Waite would report to the Commission on: The possibility of increasing the output from existing plants; power station organisation; and operation of the generating system generally. He would also advise the Commission on ways to speed up the power station construction programme—that is N.S.W.'s principal headache.

Another British engineer, Mr. R. A. Mountain, partner in Kennedy and Donkin, the consulting engineers, is also in Sydney as a valuer for the Electricity Commission in the negotiations for the taking over of the Balmain Electric Light and Power Co. As the cost is expected to be some millions, the Government decided to obtain expert advice as to the proceedings on valuation.

A Second Port Augusta?

The South Australia Government is awaiting a report from the Mines Department on the quality of coal at Leigh Creek before deciding whether to erect a second power station at Port Augusta, Mr. R. H. M. Lea, chief engineer and general manager of the Electricity Trust stated a few days ago. But from information at present available he felt there was no doubt that the station would be built. He expected that the first of the heavy equipment for the power station now under construction would be shipped from England in July. And stockpiling of coal would begin as soon as the Commonwealth Railways could transport it.

Sale of Fremantle Undertakings

A draft agreement between the Western Australia Government and the Fremantle Municipal Tramways and Electric Lighting Board provides for payment by the Government of £550,000 for Fremantle's electricity undertaking, the City Council has been told by the Mayor, Mr. W. F. Samson. But the agreement stipulates that the Board should keep the tramway system, and the Government would hand over an additional £100,000. The Mayor said that the interest received by the Board would amount to £22,500 a year, and that the trams would have to be replaced by buses. With this assistance the board thought that it would be able to make Fremantle transport pay its way. But the council feel that further information is needed on the matter. Some months ago it was agreed by an overwhelming majority at a meeting of members of both councils concerned that if any sale were to be made it should be of both the electricity undertaking and the tramway system.

Winnipeg Asks "Yes" or "No"

The public referendum on the power question is to be held in Winnipeg on April 16, if the city Council approves a recommendation just made by the Finance Committee. The issue has been referred to all the electors, not merely to the ratepayers who under the city charter are the only ones eligible to vote on bylaws involving expenditure of money. Special legislation gave the city the power to refer the issue to the electors. If the majority vote approves the city council recommendation to carry out Plan "C" of the 1948 Hogg report, which involved handing over all power resources to the province and co-operating in reorganising the power industry as proposed by the Manitoba Hydro Electric Board, the city will still have to get new authority from the Legislature to proceed without reference to the ratepayers. This would be contained in a new bill which the Legislature is prepared to pass. If the majority vote is "No," it is not so certain the Legislature will agree to give the city power to by-pass its ratepayers. It seems likely, however, the approval will be given as the government evidently considers that Plan "C" is the most desirable solution of the power question.

Reinforcement

Blenheim Public Utilities Commission, Ontario, has decided to spend $30,000 on a two-year programme of improvement of the local hydro system. The town council has approved the issue of debentures to cover the cost. Most of the expenditure is for new power lines and transformers.

Expansion

A second major step in the expansion programme of John Inglis Co. and its associated company, English Electric Co. of Canada, is now under way. The latter is carrying out a $350,000 extension programme at its St. Catherines (Ontario) plant which will provide 20,000 sq ft of additional floor space. Construction of John Inglis Co.'s new Scarboro plant is proceeding on schedule with completion expected by midsummer. The modern glass and steel building will provide some 165,000 sq ft of floor space.

Swiss-French Exchange

Two Swiss firms have been authorised by the Federal authorities to to export current to France during the summer in return for French exports of electricity during the winter months. The A.G. Kraftwerk Laufenberg

will transmit power, up to a maximum of 35,000 kW during the period May 1 to October 31, to the French concern, Electricite de France. The latter in turn will transmit power in the opposite direction between November 1 and March 31, 1953. The authorisation will remain valid until May 31, 1959. The Energie Electrique du Simplon has also been authorised to exchange power with the French concern, under the same conditions, until March 31, 1960.

No Protective Duty on Fans

The Indian Government has decided not to impose any protective duty on electric fans. In this, they have accepted the findings of the Tariff Board. The report of that Board stated that having regard to the comparative figures of landed costs of imports and the fair selling prices of the indigenous products, and also the restriction of imports, there was no case for the imposition of such a duty. It is also considered that there is no case for a reduction of import duties on raw materials at present. But if it later became necessary to export the local fans against keen competition, the question of easing the duties on imported raw materials should be favourably considered by the Government. And in addition to suggesting that the Indian Standards Institution should expedite the formulation of standard specifications for all types of electric fans, the Board urge the local manufacturers to take note of criticisms regarding the need for considerable improvement in the construction and finish of the local product.

N.W.F.P. Stations

The North West Frontier Provincial Government, at a recent meeting, decided to sanction the establishment of diesel generating stations at Kulachi and Thal at an estimated cost of Rs. 1,25,000 and Rs. 1,86,000 respectively.

Standard Mark

A Bill to provide for the marking of goods conforming to standards of the Indian Standards Institution was recently presented in the Indian Parliament. A select committee's report advocates the adoption of a mark with pictorial representation, but suggests it is not necessary to vest the Institution of powers of search and seizure for wrong use of the mark. But this latter point has been contested.

Loan for Electricity Development

It was announced last Thursday that the International Bank had agreed to make a loan of $28 million (£10 million) to Southern Rhodesia to be used to purchase equipment to expand electricity production in the Colony. The money is to be spent by the Electricity Supply Commission of Southern Rhodesia on its four-year development plan, and by the two municipal electricity undertakings, Salisbury and Bulawayo. It will be recalled that we recorded last November that the Southern Rhodesia Government proposed to allocate £1,000,000 for the construction of a new power station at Lusaka, plus £30,000 for transmission lines. (There is already a new station being erected at Shabani, which should be in operation by 1953.) Earlier we noted that the Salisbury Municipal Electricity Department had prepared a scheme, to cost several million pounds, for extending generating facilities, etc. Bulawayo, too, is now engaged in installing additional generating plant and has started on its task of changing over the existing 11 kV distribution system to 33 kV. (Incidentally, our note in Feb. 21 issue concerning Salisbury, should have referred to the Electricity Supply Commission of Southern Rhodesia, not South Africa).

Congo Development

Plans have been prepared for the construction of a further hydro-electric station in the Belgian Congo. To be known as the Marinel power station, it will be built on the south-east Belgian Congo, farther downstream from the Delcomune station. The new plant, which should be in operation by 1957, is expected to have an annual output of 1,000 million units. With this station and the three hydro-electric power stations either being built or in operation, the hydro-electric potential for the Union Miniere du Haut Katanga will reach an annual output of 2,000 million units.

Funds for Japan

The Japanese Government has been permitted to release Y9,593,000,000 from the U.S. Aid Counterpart funds as a loan to the nation's nine electric power companies to enable them to increase their power supply. The loans will be used for a Y77,000,000,000 plan scheduled to get under way this fiscal year to increase the power supply capacity by 5,444,000,000 kWh. Under this plan, 22 hydro-electric and 10 coal power plants will be built and 32 power transmission and transformer systems will be expanded.

As a further means of expansion the Electric Resources Development Bill has been presented to the Diet. This provides for the creation of a special power resources company to take charge of all large-scale developments, and in future the over-all plans for power development will be mapped by the Economic Stabilisation Board, not by the Public Utilities Commission, it has been decided.

Another Plant

Construction of the Maruyama power plant in the Kiso River valley in Gifu Prefecture, probably the largest hydro-electric project ever undertaken in Japan, has recently been resumed by the Kansai Electric Power Co., Ltd., after years of suspension due to the war. The station is to be equipped with two generators and is scheduled for completion in March, 1954. Its maximum power output is estimated at 105,000 kW, the average being about 31,500 kW. Annual output is put at 603 million units.

PERSONALITIES

IN THE INDUSTRY

Mr. Wm. C. Handley, B.SC.(Tech.), M.I.E.E., has been elected chairman of the Metropolitan Electric Cable and Construction Co., Ltd., in place of **Mr. T. H. Martin-Harvey,** A.M.I.E.E., who recently resigned from that position and from his seat on the Board, as we have already recorded. **Lt.-Gen. Sir Ronald M. Scobie,** K.B.E., C.B., M.C., has been elected to the vacancy thus created on the Board.

Mr. Wm. C. Handley

Miss K. M. Guiver, of the Eastern Electricity Board, Watford, has been awarded the E.A.W. Diploma in electrical housecraft for demonstrators in all three subjects—salesmanship, laundry demonstration, and cookery demonstration, in which she obtained a first class.

This is the time of the year for many representatives of British concerns to travel overseas on business. Last week-end **Mr. J. M. Storey,** managing director of Dewrance and Co Ltd., left for Australia *via* the U.S.A. While in the U.S.A. Mr. Storey hopes to complete arrangements with certain American valve manufacturers who are interested in a number of Dewrance patents. In Australia, further discussions will take place in connection with the large amount of power station business which the company is now undertaking.

Mr. J. M. Storey

We also have news that four executives of the export department of Hoover Ltd. have just set off on air tours to investigate possibilities of extending overseas trade. They are three export divisional managers, **Mr. A. Potts, Mr. G. Cooper** and **Mr. H. E. Duggans,** and Mr. **A. H. G. Hall,** assistant export divisional manager. Mr. Potts will tour South America; Mr. Cooper's itinerary covers central Africa, including Kenya, Uganda, and Tanganyika; Mr. Duggans is going to India, Ceylon, Malaya, Indonesia, Indo-China, the Philippines, Hong Kong, Thailand and Burma, while Mr. Hall is visiting the West Indies, Panama, Costa Rica, Mexico, Cuba and other republics in central America, returning home *via* Bermuda. Meanwhile, **Mr. V. C. Mumford,** export manager, and **Miss M. E. Cowan,** consultant on one of the company's products, have just returned from a tour of Scandinavia.

Hoover "ambassadors of trade" study the maps. Left to right: Messrs. Cooper, Duggans, Mumford, Crowlie, Potts and Hall

Mr A. B. Graham, manager, Zenith Works of Henry Wiggin and Co. at Thornliebank, Glasgow, has been elected to the delegate board of that company.

Bruce Peebles and Co., Ltd., announce the appointment of **Mr. R. W. Flux,** A.M.I.E.E., latterly of the chief engineer's department of the B.E.A., to the newly created post of chief engineer of the Transformer Department in which capacity he will be responsible to Mr. P. Butler, joint general manager for decisions affecting the company's transformer business. Mr. Flux takes up his new duties this month, we understand.

Mr. R. P. Wingate, lighting engineer for Newcastle-upon-Tyne to the British Thomson-Houston Co., has left to take up an appointment with the Company's Lighting Department at Mazda House, Fitzroy Road, London, **Mr. J. S. Smith,** has been appointed lighting engineer at Newcastle office in his stead.

Mr. H. F. Bibby, B.SC.(Tech.), A.M.I.E.E., A.M.I. Mech.E., previously manager at The Hague, has been appointed manager of the American Division of the Metropolitan-Vickers Electrical Export Co., in London. He joined M-V. in 1929 for a probationary apprenticeship course, and afterwards served in the motor engineering dept. In 1939 he transferred to M-V. Export Co. and went to The Hague. After war-time development work in the motor engineering dept., he rejoined the Export Co. and opened the new office at The Hague. Last year he spent several months in South America.

Also off on a business trip to South Africa and Rhodesia is **Mr. T. A. Long,** managing director of Bonar, Long and Co., Ltd. He left Southampton last Thursday in the *Edinburgh Castle*, intending to consolidate his many business interests in the Union and return early in April.

Mr. J. B. Butterworth, of Clitheroe, and formerly of Ormskirk, has been appointed district engineer, Galashiels, to the South East Scotland Electricity Board. He takes up his new duties early next month.

The end of this month will bring the retirement of **Mr. S. G. Poole,** A.M.I.E.E., from the post of district manager at Peterborough, Fens Sub-area of the Eastern Electricity Board, which he has held since vesting day. In all, Mr. Poole has served for over 46 years at Peterborough, and during that time has been prominently associated with the development of the undertaking. Educated at Stamford Grammar School, he was subsequently articled to the Urban Electric Supply Co. and later served that company for a time as mains engineer at Grantham and shift engineer at Salisbury. He joined the Peterborough electricity undertaking late in 1905 as a shift engineer, and in 1920 was appointed second assistant engineer in charge of mains, later becoming distribution engineer, which position he held till vesting day. We understand that many of Mr. Poole's friends will be attending a dinner and presentation arranged in his honour on March 27.

Mr. S. G. Poole

Last week-end saw the retirement of **Mr. J. W. Faulkner,** B.SC.(HONS.), M.I.E.E., meter superintendent of the North Eastern Electricity Board. He has been succeeded by **Mr. A. J. Colgan,** A.M.I.E.E. Mr. Faulkner joined Metropolitan-Vickers Electrical Co. in 1913 and in the following year became a student with the Cleveland and Durham Electric Power Co. In 1921 he was appointed southern area section engineer in the testing dept. of the Newcastle-upon-Tyne Electric Supply Co. (later the North Eastern Electric Supply Co.), and in 1944 was promoted to meter and testing engineer in the operation department of that company. His successor, Mr. Colgan, has been closely associated with meters and electrical testing during the whole of his career. He started with the North Eastern Electric Supply Co. in 1932 and later held various appointments in the testing department of that company, and has subsequently been on the chief engineer's staff at the N.E- Board's H.Q.

Mr. J. W. Faulkner

Mr. A. J. Colgan

City electrical engineer and general manager at Belfast since 1942, **Mr. W. J. M'C. Girvan,** O.B.E., A.M.I.E.E., is to retire from that position at the end of September next. This information was given to the Corporation Electricity Committee at its meeting last Friday. It will be recalled that more than six months ago Mr. Girvan and some members of the Corporation were in dispute over the appointment of a deputy electricity engineer and manager in place of Mr. J. M'Candless who resigned to take up another post. The nomination of **Mr. R. P. Watson,** B.A., B.A.I., M.I.E.E., as the new deputy was the occasion of further disagreement (as we reported on February 7) and Mr. Girvan said that he would have to consider his position, resulting in his tendering his resignation at last Friday's meeting. Mr. Girvan started with the Corporation Electricity Department 39 years ago as a substation attendant, and in 1935 became deputy electrical engineer, being promoted to the major position in 1942. When Mr. Girvan retires he automatically ceases to be a member of the Northern Ireland Joint Electricity Committee. He resigned that position last September, but the Northern Ireland Government refused to accept it.

Mr. W. J. M'C. Girvan

As from March 10, **Mr. E. R. Radway,** M.I.Mech.E., A.M.I.E.E., A.M.I.Struct.E., has been appointed mechanical and electrical engineer at South Wales Docks. Trained at Swindon Railway works, he entered the chief mechanical engineer's drawing office in 1932, where he was engaged on dock, hydraulic, and electrical work until 1946. After a period at Worcester as electrical assistant to the locomotive divisional superintendent he was transferred to the Cardiff railway division as assistant electrical engineer. In February 1950, he was appointed electrical enginner, South Wales Dock, and in January last, took on the additional responsibility of mechanical engineer for Newport, Cardiff, Penarth and Barry Docks.

After 38 years as manager of the Southampton branch of British Insulated Callender's Cables Ltd. and the former Callender's Cable and

Construction Co., **Mr. W. G. Holmes,** retired last week-end. The occasion was marked by the presentation by Mr. O. W. Minshull, manager (home sales) of a cheque from his colleagues in the home sales organisation. His successor is **Mr. E. Hitchen,** who joined the former Callenders' Cable and Construction Co., Ltd., at Leigh in 1920. Subsequently he gained wide sales experience in Manchester and London. After war service, he returned to B.I.C.C. as a sales representative in North West London.

British Railways announce the appointment of **Mr. H. F. Jarvis,** A.M.I.E.E., senior technical assistant (outdoor machinery), mechanical and electrical engineer's office, Doncaster, as electric traction engineer (Tyneside area), Gateshead. Apprenticed with Pilkington Bros., he joined the North Eastern Electricity Supply Co., and in 1935, when the operation of their substations in the Tyneside area was taken over, he transferred to the L.N.E.R. After a period as electric control engineer at Wallsend he served as senior technical assistant in the North Eastern Region electrical engineer's office at Gateshead, and last year went to Doncaster to take up the post he now vacates.

Mr. H. F. Jarvis

Latterly district motive power superintendent, York, to British Railways, **Mr. T. Matthewson-Dick,** A.M.I.Mech.E., A.M.I.E.E., M.I.Loco.E., Assoc. Inst. T., has been appointed to a similar position at Newcastle-upon-Tyne, North Eastern Region. Actually it was there he started in railway service in the electrical dept. of the L.N.E.R. in 1923. Subsequently, he served at Darlington, Gateshead, York, Middlesbrough, Edinburgh and Sunderland. For a number of years he also lectured on mechanical and electrical subjects.

Mr. G. Darnley Smith, managing director of Bush Radio Ltd. and Cinema-Television Ltd. has been elected chairman of the Radio Industry Council in succession to **Mr. J. W. Ridgeway,** O.B.E. (Ediswan), who has been chairman since 1948. Mr. Darnley Smith was chairman in 1947 and has been chairman of the Industry Television Policy Committee since its formation in 1948. **Mr. G. A. Marriott,** B.A., manager of the valves and electronic devices department of the General Electric Co., Ltd. and a director of the Marconi-Osram Valve Co., Ltd., was elected vice-chairman. **Mr. P. H. Spagnoletti,** B.A., M.I.E.E., director and general manager of Kolster-Brandes Ltd., and manager of the Brimar Valve Works of Standard Telephones and Cables Ltd., and **Mr. E. K. Balcombe,** managing director of A. J. Balcombe Ltd., were last Friday, re-elected chairman and vice-chairman respectively of the British Radio Equipment Manufacturers' Association.

Mr. Robert Craig, Assoc. I.E.E. who has been appointed works manager of the Pressed Steel Co. Ltd., Oxford, in succession to **Mr. H. J. Wood,** who recently retired, joined the company on its inception in 1926, and was in charge of the Electrical Department. Mr. Craig gained early experience with Crompton and Co. Ltd., at Chelmsford, and six years after joining the Pressed Steel Co., he was appointed works engineer. After ten years in that position he was made assistant works manager in 1948.

Recently appointed personnel manager to the Metropolitan-Vickers Electrical Co. Ltd. is **Mr. D. J. Crowther,** M.A., who joined the firm as a special trainee in 1939. In the same year he joined the staff of the education department as a technical assistant, and after war service in the R.A.F.V.R., returned to the company, becoming a section leader in the education dept. in 1951. He is a son of the late J. A. Crowther, professor emeritus of physics at Reading University.

Mr. D. J. Crowther

Appointed deputy station superintendent at Blackburn Meadows generation station, Yorkshire Division of the B.E.A., is **Mr. A. Bartle,** Assoc. I.E.E., who has been station superintendent at Doncaster power station in the same division. Mr. Bartle studied at Barnsley Technical College and served his apprenticeship at the Corporation's power station, ultimately becoming boiler and turbine house superintendent there before taking up his recent post at Doncaster on vesting day. He took up his new duties this week.

At a representative gathering of the staff of Hopkinsons Ltd., Huddersfield last Friday, a presentation was made to **Mr. W. B. Dale,** M.I.Mech.E., A.M.I.E.E., to mark his retirement as general manager of the Electrical and Controls Department after 31 years with the firm. **Mr. R. McKie,** director and secretary, presented Mr. Dale with a cheque on behalf of the directors and general staff; another cheque was presented from the staff and employees of the Electrical and Controls Department. **Mr. G. Sewell,** director and chief engineer, presided. Mr. Dale has been responsible for many developments in the field of the power operation and automatic control of valves, especially in connection with the main stop valves installed by Hopkinsons in the majority of British power stations and in many important installations overseas, often involving centralised control cubicles, panels, desks and interlocking equipment. He has also done much pioneer work in the automatic control of pressure and temperature, and has been responsible for the design of some of the largest pressure reducing valves and desuperheaters in this country.

OBITUARY

Mr. Thomas J. McBride, of the Benjamin Electric Co. Ltd., died on February 23, aged 64. He had been connected with the Benjamin Co. since 1926, and for the past twenty-four years had acted as technical sales representative in Eire and Northern Ireland. During that time he made numerous friends in the trade, among whom he was popularly known as "the Yank."

Mr. Thomas J. McBride

Mr. Stuart Bell, formerly joint manager for Scotland for the English Electric Co. Ltd., died recently, aged 80. Apprenticed with W. Denny of Dumbarton, he spent some time in the Argentine before becoming Scottish agent for Schuckert and Co. in 1906. A few years later when that concern was acquired by Siemens, Mr. Bell became their first Scottish branch manager. When the English Electric Co. was formed in 1919 he became joint manager for Scotland and continued in that capacity until he retired.

Mr. C. A. Robinson, late general manager of the Bombay Telephone Co. Ltd., died on March 3.

Wills.—Mr. R. J. S. Bower, managing director of Bower Engineering Works (Electrical and General) left £27,589 gross (£26,040 net).

Mr. G. G. Smith, latterly educational instrument sales specialist to Crompton Parkinson Ltd., left £1,724 gross (£1,580 net).

Mr. A. Vines, founder and chairman of Evershed and Vignoles Ltd., left £69,402 gross (£68,049 net).

Mr. A. F. Lee, chief electrical engineer, Austin-Crompton Parkinson Electric Vehicles Ltd., left £14,657 gross (£14,349 net).

BRITISH STANDARDS

Rubber Mats for Electrical Purposes *B.S.* 921:1952, *price* 2*s.* In this revision the voltage of the equipment for which the mats are intended to be used is limited to 650 V r.m.s. to earth. The 1940 edition covered mats in use up to 3,300 V to earth, and the limit of 650 V has been introduced in this revision in order to avoid any misapprehension as to the requirements of the Electricity (Factories Act) Special Regulations, 1908 and 1944. The revision specifies requirements for construction, dimensions, finish and marking, together with details of electrical, mechanical and ageing tests.

Gears for Instruments and Clockwork Mechanisms. Part 3: Bevel Gears. *B.S. 978:1952. Price 3s. 6d.* This part of B.S. 978 deals with bevel gears which were not covered by the standard published in 1941. It relates to machine-cut conical gears connecting intersecting shafts and having pitches from 20 to 80 D.P. The teeth have a normal pressure of 20° at the pitch cone and they may be either straight or curved. It provides for the form of gear tooth and lays down the permissible errors and tolerances for two classes of gears—Class A for use where a high degree of accuracy is required, and Class B for other applications. It also deals with the modification to the addendum required for small numbers of teeth and the relative clause includes an example illustrating the method of application.

Gears for Instruments and Clockwork Mechanisms. Part 2: Cycloidal Type Gears. *B.S. 978:1952. Price 3s. 6d.* This part of B.S. 978 applies to cycloidal type spur gears for spring or weight-driven mechanisms in which the pinion is the driven member or where the pinion is required to act sometimes as the driver and sometimes as the driven member. Whereas the original edition specified a circular arc form of tooth, this revision has been based on the standards of Swiss and Black Forest watch and clock industries.

Guide to Civil Land Aerodrome Lighting *B.S. 1332:1952. Price 3s.* This new revision of the standard provides a description of the probable future requirements for aerodrome lighting equipment to give adequate assistance to the pilot of an aircraft in all conditions in which it is anticipated that operations can be carried out both by day and by night. The guide is issued with the approval of the Ministry of Civil Aviation, and it gives information on beacons, approach, threshold, runway, taxiway, obstruction and boundary lights, and in addition it deals with flood lights, traction indicators, ground traffic signalling lights and portable and emergency lighting. A diagrammatical arrangement of lights on an aerodrome is included, together with appropriate graphical symbols.

Enamel (oleo-resinous) and Cotton-covered Round Copper Wires *B.S. 1815, 1952. Price* 2*s.* This standard sets out the requirements of enamelled wires to B.S. 156, "Enamelled round copper wire (oleo-resinous enamel)", having a covering of cotton consisting of one or two layers, in which the cotton is applied by winding the yarns helically round the wire. It does not apply to such kinds of cotton covering as braiding. It includes all sizes of wires from 0·0060 to 0·160 in. in diameter and deals with four types of enamel and cotton covered wires. It includes requirements for the cotton covering, elongation of the covered wire, measurement of the diameter of the enamelled wire and the overall diameter, and for reels, reeling, packing, wrapping and labelling.

British Standards reviewed above can be obtained at the prices quoted from the B.S.I., 24 Victoria Street, London W.1.

REMOTE CONTROL

for Cape Province Hydro Station

REMOTE control provides an economical method of supervising small hydro-stations, and an interesting example of its application overseas is provided by a General Electric Company installation at Umtata, in Cape Province, South Africa. The river which gives the town its name drops some 108 feet at falls four miles or so from the town. There has been a power station here for some time, with a low dam above the falls and a 100 kW generator installed. Recently the General Electric Company has supplied an additional 150 kW generator, and a new pipe line has been laid to increase the water supply to the station.

The new generator is powered by a 225 h.p. 750 r.p.m. Francis turbine, operating under a water head of 91 feet and a suction head of 17 feet. This generator is directly coupled to a flywheel and a 200 kVA, 400/230 V 3 ph 50 c/s alternator. Normally, the old and new sets supply their power to the town power station over separate 3·3 kV transmission lines, but paralleling gear is available so that either line may be used for the full power of the station.

Power for the remote control system is derived from a 380/200 V three-phase supply at the Town power station. Two "orders" are possible—"start and speed up" or "slow down and stop," and these are differentiated by applying either 380 V or 220 V to a voltage sensitive relay.

On starting, the main field contactor is closed, and a supply from a 24 V battery is switched on to the motor controlling the sluice valve. This then begins to open. The set then picks up speed and eventually the governor takes over control. With the main field excited, voltage increases with speed, and at a predetermined value a relay operates to close the o.c.b. connecting the generator to the line.

When the sluice valve is fully open, a limit switch disconnects its driving motor, and causes switching arrangements which enable the "start" button to be used for speed raising, or the "stop" for speed lowering. When the latter button is depressed and the speed allowed to drop to the lower limit of governor control, a change over limit switch disconnects the governor control circuit and energises a "close" contactor on the sluice valve motor. Further switches initiate the opening of the main o.c.b. and the main field switch.

Protection

Protection is provided within the plant against excessive bearing temperature overspeed, governor failure and internal faults of the alternator and transformer. If any of these faults occur, a lock-out relay operates to trip the main o.c.b., and the field contactor. When a line fault occurs, the o.c.b. is opened, but the set left running. On depressing the "start" button at the Town station, the o.c.b. is closed. If the fault has not cleared by this time, the lock-out relay operates to shut down the station. This entails a visit to the station to reset it.

One other feature of the plant remains to be described: because of the frequent occurrence of electrical storms during the rainy season in this part of South Africa, the pilot control wires are isolated through a 1:1 transformer, and surge divertors are provided.

250 kW of plant are installed in this isolated hydro station. The automatically controlled station is seen in the foreground

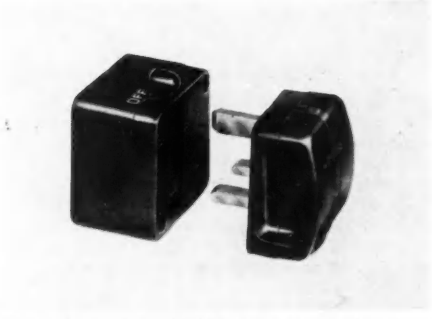
The BUYER'S *Column*

Lundberg's Latest Switch Socket

RELEASED to stockists recently by SIMPLEX ELECTRIC CO. LTD., Broadwell, Oldbury, Birmingham, is the new Lundberg 13-amp switch socket.

These all-insulated switch sockets are designed for surface and flush mounting and comprise double-pole a.c. switches with heavy silver contacts. Reinforcing springs are fitted to ensure adequate contact pressure.

The socket, which is shuttered, has an ingenious construction which permits the switch dolly to be



The new Lundberg 53200 *has clean modern lines*

mounted on the top of the socket out of the way of damage.

The surface pattern Cat. No. 53200 is now available. Its dimensions are 2 in. by 2 in. by $1\frac{5}{16}$ in. The finish is brown synthetic resin and there are four knockouts for easy installation work. A flush pattern No. 53400 will be available shortly. To fit B.S. 1299 Box, this socket has the same finish but dimensions are $3\frac{1}{4}$ in. by $3\frac{1}{4}$ in.

List price at time of going to press is 11s. 4d. each for both flush and surface patterns.

Decorative and Efficient Lighting

NEW models which are attractive as well as efficient are the "Plexilux" and "Diffluor" lighting fittings which we have illustrated on this page.

These fittings, made by the FRANCO-BRITISH ELECTRICAL CO. LTD., 15-17 King St., London S.W.1, have many advantages which will be apparent to lighting engineers.

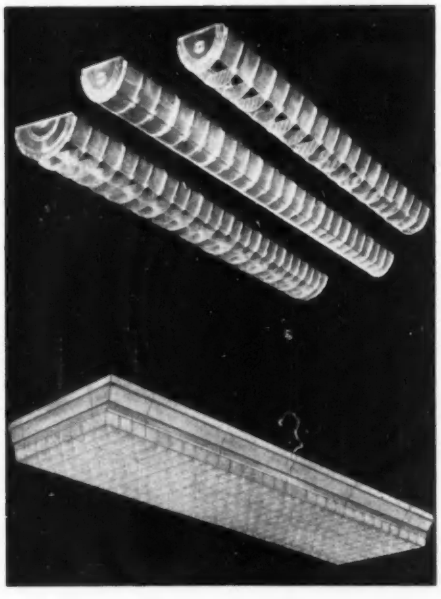
The "Diffluor" fittings at the top of the illustration are of the closed or open patterns. They are moulded from a hard crystal plastic which is highly translucent. End covers are in the same material, thus allowing the maximum light to pass through, yet there is no glare as the refracting surfaces of the diffusing screen break up the light rays almost at source. Lightness in weight is another advantage, and the simplicity of construction helps in cleaning. These fittings may be installed either ceiling mounted or suspended and accommodate any of the standard hot-cathode lamps available.

The "Plexilux" fitting is similarly constructed and is available for locations where something more than the "Diffluor" pattern is called for. Here again the sides are translucent, the "egg-box" louvre at the base of the fitting helping in the diffusing problem. Introduced as a standard feature of the company's "Luxolite" fittings, the screen of prismatic sections locked at right angles proved so popular that it is being standardised in the "Plexilux" range. This fitting illustrated (L119) has an open top and is suitable for three 5 ft hot-cathode lamps.

Expanded Metal Resistances

AN ideal resistance should be unbreakable, able to withstand vibration, adequately insulated, jointless, non-corrodible, light in weight and of low temperature coefficient, yet able to deal with temperatures far in excess of those normally encountered in operation.

The expanded metal resistance has been designed with these requirements in mind, and this, associated with the use of the highest qualities, has resulted in the production of first-quality units by the EXPANDED METAL CO. LTD., Stranton Works, West Hartlepool, Co. Durham.



The applications of these resistances are many, the following being a selection which are well suited. Traction uses include locomotives, trams and trolley buses, and battery trucks. Industrial uses are in motor starters, steel mill auxiliaries, cranes, furnace chargers, rolling-mill motors, electric welders, battery charging. For marine use in winches, derricks, windlasses and searchlights, and for heating purposes in duct and convector heaters, and drying and stoving elements.

Typical non-rusting materials used in the construction of these resistances are nickel-chrome steel, Ferry, Glowray and Brightray.

Price Increases

AS from Monday, February 18, 1952, the current advance on the list prices for "Bill" switch and distribution gear in publication G.551, issued by BILL SWITCHGEAR LTD., Aston Lane, Perry Barr, Birmingham 20, was increased from 20% to 30%.

The advance on "English Electric" cartridges, also appearing in this publication, was increased by the manufacturers from 120% to 147½% as from January 28, 1952. This advance does not, however, include switch plugs, plugs and sockets, which remain at 20% advance.

"Snug" Floodwarmth!

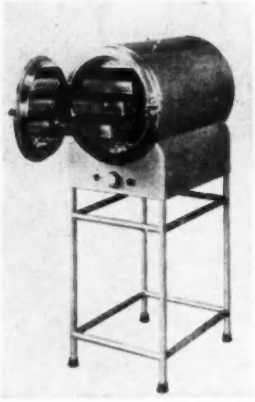
FLAT dwellers with restricted space will like the new "Snug"-type "Floodwarmth" convector heater which has been designed especially for them by UNITY HEATING LTD., Chilworth Manor, Southampton.

Neat in appearance, the heater has an internal glow lamp which adds psychological warmth to the adequate heating capabilities of this economical model.

A convenient terminal box is fitted and thermostatic control is available in the Model 1941, as seen in the illustration, which is operated by a control wheel on the right-hand side of the heater.

The heater is portable, is supplied with 4 ft of flexible cable. It is finished in cream/gold, light green/gold or rose/gold-pink enamels. Rating of both models (1941, with thermostat) or 1942 (without) is 750 W for supplies 200-250 V.

This Boxer appreciates the "Snug" floodwarmth



This is the new steriliser produced by Surgical Equipment Supplies which we noted in our February 14 issue

The "Jahrzeit" Memorial Candle

A NEW product just marketed by ELRADIO AND ELECTRICAL CO., 15 Radcliffe New Rd., Whitefield, Lancs., is the "Jahrzeit" memorial candle.

Simple in construction, this memorial candle basically comprises a neon glow lamp in which the electrode is in the form of the Shield of David.

Suitable for 100-120 or 200-250 V a.c. or d.c. supplies the memorial candle is priced 15s. 6d.

TRADE PUBLICATIONS

FLOOR POLISHERS.—Leaflets featuring the "Juno" floor polisher (SH278) and the "Plus Packs" which afford extra facilities (SH274), which were noted in these columns recently, have now been issued by Truvox Ltd., Exhibition Grounds, Wembley, Middlesex.

THE GYROSCOPE.—An interesting booklet issued by the Sperry Gyroscope Co. Ltd., Great West Road, Brentford, Middlesex, entitled "The Gyroscope through the Ages," tells the story of early gyroscopes, and the part the companies in America and the U.K. have played in applying the instrument to the navigation of ships and aircraft during the past half-century.

PUBLIC ADDRESS SYSTEM.—New publication 1162 is a leaflet issued by the Automatic Telephone and Electric Co. Ltd., Strowger Works, Liverpool 7, which features the public address and sound reproduction systems available from the company.

AIR CLEANSING EQUIPMENT.—Two new publications issued by Air Control Installations Ltd., Ruislip, Middlesex, show the "Multi-Duty Air Filter" (B515) and the "Air-Mat Dust Arrester" (B521).

SWITCHGEAR.—33 kV indoor metal-clad units are featured in No. 11 issue of Cooke and Ferguson Ltd.'s "Switchgear News." This is obtainable from the company at Openshaw, Manchester, and Craven House, Kingsway W.C.2.

Milling Machine Safeguards

AN 11-member committee of factory inspectors and engineers has, since 1945, been investigating the special problems of guarding which milling machines permit. An interim report was issued in 1947, covering machines used for repetition work. Now a second report has been published by H.M. Stationery Office (price 3s. 6d.), dealing with special purpose and other machines which present rather different problems.

Naturally, the greater part of the profusely illustrated 36-page report is concerned with the construction and placing of mechanical guards. It is intended to confine this notice, however, to the remarks made on the electrical equipment of milling machines.

The report notes that additional electrical gear has often to be provided on special purpose and on large machines, and that when electrically interlocked guards are incorporated, special considerations arise which may involve the fitting of means of braking and quick stopping devices. For details, reference is made to the I.E.E. papers that have been prepared by Mr. W. Fordham Cooper on "The Electrical Control of Dangerous Machinery and Processes."

Low voltage controls are recommended from the safety aspect, and it is suggested that for large machines electrical controls should normally be of a suspended or portable type, which can be operated from any desired position on or around a machine. Pushbuttons should be coloured to indicate "start" and "stop," and start buttons deeply shrouded to prevent accidental depression. A master button should be provided for starting.

Contactor gear, it is recommended, should be housed in suitable containers, or in panel-type boxes fitted with interlocking covers or doors such that when opened the electrical energy is automatically switched off from the enclosed gear. Indicator lights should be provided to show if any particular motor is running or not.

Master Button

The idea of the master button, as developed in the report, is that it must be depressed simultaneously with any single motor "start" button to set the motor in motion; the intention is to reduce the risk of unexpected starting due to casual playing with buttons.

Special illuminated indicators picking out, for instance, the stop buttons, have been noted on some machines, and these are recommended to the attention of designers.

Only the Best is Good Enough!

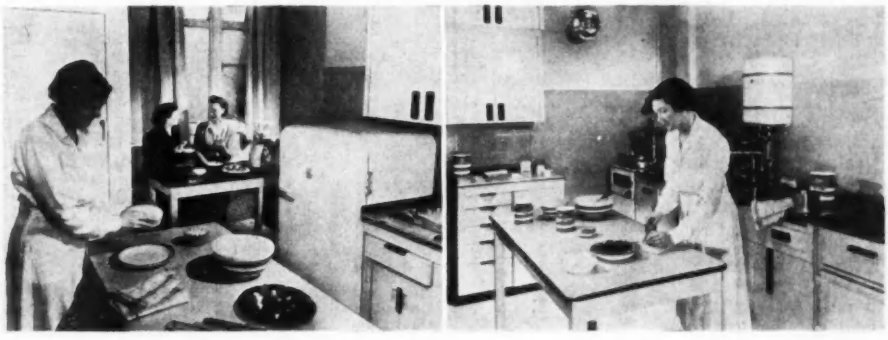
NEW TEST KITCHEN USES ELECTRICITY TO ITS CLIENTS' ADVANTAGE

HANDLING a large number of food accounts, the advertising agency of Young and Rubicam Ltd., decided recently to instal a test kitchen where they could create and test recipes, using their clients' food products, carry out experimental work on new food products and do taste tests, washing tests and photographic work, which is part of the normal daily routine of such an agency.

Showing considerable wisdom in their choice, the agency have included several important electrical appliances in the equipment installed. These up-to-date units include a Prestcold refrigerator, a Jackson cooker, a Hoover washing machine, Berry's New Look water heater, and a Hotpoint electric bowl fire mounted on the wall to ensure a comfortable temperature for work.

In tasteful colour schemes of pink, grey, yellow and black and cream, the kitchen includes a section set up as a dining room, with patterned wallpaper, a dining table for taste testing and comfortable wall seats suitable for interior photographic scenes.

Cleanliness and comfortable conditions are features of the new kitchen



The WEEK in NEWS

Price Limit on Cable Exports Cut

Increase in Trade Unlikely

LICENSING arrangements for copper cables and wires have been eased considerably following an announcement by the Board of Trade last week. The relaxation applies to covered and insulated cables and wires wholly or mainly of copper or of copper alloys. These will only require individual export licences in future if the f.o.b. value is less than the value of the copper or copper alloy content calculated at £400 per ton.

Previously the exemption of these goods from individual licensing was confined to those with a value of at least £700 per ton of copper content or £600 of copper alloy content. The effect of this relaxation, theoretically at least, will be to give greater freedom of export to manufacturers of these commodities, and as such is welcomed by this branch of the industry. In practice no immediate effect is likely—it will probably be some time before any increase in exports takes place as their extent depends less on licensing than on the supply of essential materials.

One prominent manufacturer, commenting on the relaxation, said his company was already exporting as much as it could. Orders had to be refused because of the shortage of copper and of the difficulty in obtaining such items as armouring wire and paper. He stated that even if licences were removed completely output to overseas markets would not be increased at the present time.

Malaya is a Ready Market

DESPITE the unsettled conditions in Malaya, the prospects for British manufacturers in that country are extremely good. The Overseas Economic Survey, just published, presents numerous outlets for British goods, particularly as there is already an established market.

As a result of the war and Japanese occupation some 60% of plant capacity was rendered useless, and it is now estimated that the present shortage is of the order of at least 120,000 kW. When this shortage will be made up has not yet been determined but prospecting for new power stations and hydro-electric possibilities are proceeding and those to date are in the hands of U.K. firms. The majority of orders already placed are with British manufacturers.

The demand for domestic appliances, particularly for such items as fans, refrigerators, cookers and lamps, is steadily increasing, and the U.K. is well established as the main supplier of most of these goods. As regards supplies of radio sets, Holland has been rapidly overhauling the U.K., but demand for British sets is undoubtedly there and manufacturers would do well to send as many as possible.

ELECTRICITY UP TO 1d. PER UNIT IN SOUTH-EAST

AN increase from $\frac{7}{8}$d. to 1d. in the running rates of all two-part tariffs, with effect from the first meter reading after April 1, is announced by the South Eastern Electricity Board. Flat rates for lighting are not affected but cooking, heating and power flat rates of less than $1\frac{3}{4}$d. per unit are increased to that figure from the same date. Similar adjustments are also being made in certain block tariffs. The Board is in the process of standardising charges in its area, and it had been hoped to defer alterations till those proposals were complete. But the dearer coal and other rising costs made it imperative, despite economies already achieved, to raise tariffs immediately. The area Consultative Council has accepted the revisions.

The South Western Electricity Board, however, who introduced standard tariffs last August, have intimated that they do not propose to make any alterations until the effects of the present charges are known. For this Board, the new bulk supply tariff will mean an increase of £73,000 during 1952/53, and altogether an additional revenue of £376,000 will be needed from consumers in that area.

The First Half-Century

Mr. Aspinall's paper at the Institution was chiefly valuable from the large collection of facts respecting shocks, fatal and otherwise; and Mr. Trotter's was especially excellent as a scare killer. His practical demonstrations of the harmlessness of 500 V, with the slightest insulation, such as a cambric handkerchief, was very instructive, and when he rolled about on a section of the rails to show that he was not grilled alive, the crowded audience was delighted. The efforts of Mr. Hammond as showman to Mr. Trotter's clown were also much appreciated, though some thought the exhibition below the dignity of the occasion.—*From our issue of March* 6, 1902.

Lighting Ban Relaxed

Minister of Fuel Changes His Mind

THE Minister of Fuel and Power has decided to relax the ban on the use of electricity from the mains for advertisement purposes to the extent that the restricted period will now end at 5.30 p.m. Under the Order made in 1949, the use of public supplies was prohibited between 7 a.m. and 7 p.m., and this was to have remained in force this winter until April 4. The Minister has stated that so far as can be foreseen at present, plant available during March should be sufficient to meet the load.

The announcement, made last weekend, came as a surprise to those concerned, because although it was generally thought that supplies of electricity would permit such a relaxation, it was only a fortnight ago that an identical suggestion by the Electrical Sign Manufacturers' Association was rejected. As reported in our January 31 and February 21 issues, E.S.M.A. proposed that the restricted period should end at 1 p.m. or alternatively at 5.30 p.m.

AMERICAN GUESTS OF THE B.E.A.

THE American team which arrived in London last week to study our supply industry will comprise 17 members instead of 18 as announced last week. Besides the leader, Mr. C. W. Jones, they are Messrs G. X. Barker and F. Parker, International Brotherhood of Electrical Workers; T. E. Craddock, National and Rural Electricity Corpn.; J. C. Falkner, Consolidated Edison Coy.; P. Frantz, Water Side Power Station; W. Good, and H. E. Bumgardner, Detroit Edison Coy.; F. L. Goss, Dept. of Water and Power; C. Lee Karr, T. V. A.; W. Munger, Utility Workers Union; R. M. Pennypacker, Philadelphia Electric Coy., F. H. Austin, Illinois Power Coy.; H. K. Breckenridge, West Penn Power Co.; G. H. Brodnax, Georgia Power Co.; E. V. Sayles, Consumers Power Co.; G. V. Williamson, Union Electric Co. of Missouri.

FILMS TESTED BY TELEVISION

TELEVISION is likely to be employed at Elstree studios to test the possible box-office appeal of films. The first time that this method of pre-filming by television has been carried out in Britain took place last Friday, when a performance of a full-length story was "shot" by TV instead of the usual film cameras, and viewed in an adjoining theatre by a representative body of executives and film technicians. The experts were able to judge whether or not the televised story would be a likely subject for filming in the normal way.

A three-camera unit supplied by Marconi's Wireless Telegraph Co., Ltd., has been installed at Elstree for the purpose.

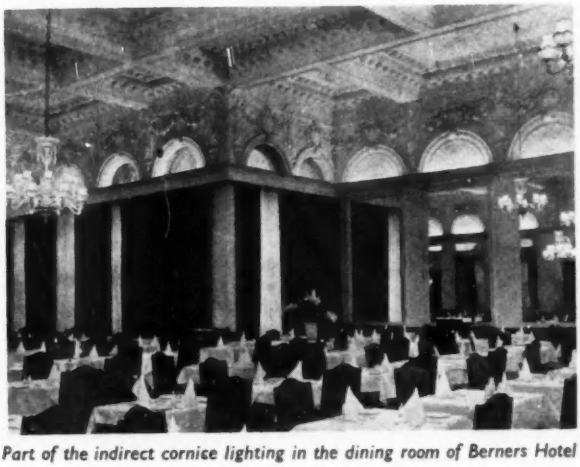
The story chosen for the initial experiment was "The Human Touch," concerning the invention of chloroform by Dr. James Simpson.

New Cornice Lighting Scheme Welcomes U.S. Visitors

ONE of the first impressions which the American guests of the B.E.A., who have come to study the British electricity supply industry (*see our February 28 issue*), gained on their arrival in London, concerned the manufacturing and contracting side rather than the supply industry. Reason for this was that one of the most recent lighting installations to be carried out was at Berners Hotel where our U.S. visitors are staying while in London.

Planned by the British Thomson-Houston Co. Ltd., and comprising that company's fittings, the scheme is notable for the attention paid to cornice lighting. To accentuate the intricate moulding of the dining-room ceiling standard bare-lamp fittings have been placed behind an opaque extended cornice which runs round the room. In addition, two mellow fluorescent lamps, placed centrally in each plaster shell-shape relief, give the required amount of light and shadow. The four chandeliers installed also retain the architectural character of the room.

Contractors for the scheme were Leonard J. Ive, Ltd.



Part of the indirect cornice lighting in the dining room of Berners Hotel

STUDY OF PRODUCTION AND MANAGEMENT

SCHOLARSHIPS for the study of production technology and management in selected universities or technological institutes and in industrial undertakings in the U.S. are being offered this year, it was announced by the Ministry of Education last week. One group of 40 awards will be made for the study of management, tenable for nine months, and a second group of 35 awards, normally tenable for a year, are to be given for the study of production technology combined with management.

Full details of the scheme may be had from the Ministry (F.E. Div.1), Curzon Street, W.1.

Meter Readers Stood Off

AS the result of increased output since work was resumed under supervisors after the recent strike, many of London's electricity meter readers have no further work to do in this period and have been stood off this week. Since the strike ended six weeks ago, no agreement of any kind has been reached between the L.E.B. and the union, and in that effect the Board considers it inadvisable to declare any of the readers redundant. A statement by the Board adds that some men are being subjected to organised pressure to reduce output, and in consequence have asked for transfer to other districts.

Inside the gasworks at Watford where mercury lamps have been installed to counter excessive smoke and steam. This illustration, taken on the discharging floor, shows how good visibility has been maintained even when a retort is being discharged

Experiments in a Gasworks

THE construction of a retort house at Watford gasworks in recent months afforded an admirable opportunity to lighting engineers to investigate the most suitable type of illumination for such circumstances. In the past little specialised attention has been paid to the provision of adequate lighting in these buildings. One of the most outstanding problems to be faced is the counteraction of smoke and steam caused when a retort is discharged, but experience showed that blue-green light did minimise the obscurity.

Accordingly, when G.E.C. engineers planned the Watford installation, it was decided to use 250 W mercury lamps in vitreous enamel reflector fittings. Six such fittings are attached to stanchions at both sides of the building to illuminate the charging and discharging floors. Two others have been placed at one end, and three to light waste heat boilers at a lower level.

The effectiveness of the completed installation can be assessed from the fact that maintenance of machinery can now be done largely without the assistance of local lighting.

FISHING BY ELECTRICITY

FISHING by electricity may sound a fabulous story even among anglers, but nevertheless experiments in this field are to be carried out this month in the River Worfe (Shropshire). Each year owners of water ask that their pools be stocked or depleted of certain types of fish, and it is hoped to catch the fish by stunning them electrically, sort and then transport them.

The electrical apparatus will operate in two ways. When a direct current is sent through the water the stunned fish sink slowly to the bottom between the positive and negative electrodes, where they can be collected. If an alternating current is used, the fish are drawn into the electrified area where they can be easily netted.

OFFICIAL PUBLICATIONS

BOLTS, NUTS, ETC., PRICES ORDER, 1952 (*S.I. No.* 362) H.M.S.O., 4d.

CENSUS OF PRODUCTION. H.M.S.O., 1s. 9d.
Report for 1948—*Trade D, Tramway, trolley-bus and omnibus.*

AERONAUTICAL RESEARCH COUNCIL. H.M.S.O., 3s.
Report on 24-way high-speed rotary switch in static and airborne strain gauge measurements.

HYDRO-ELECTRIC DEVELOPMENT (SCOTLAND) BILL.
Second and third sittings of Scottish Standing Committee. (*See p.* 436.) H.M.S.O. 9d. and 6d. resp.

OVERSEAS ECONOMIC SURVEYS. H.M.S.O., 6s. 6d.
Malaya (*see page* 454).
Ceylon H.M.S.O., 3s. 6d.

DISPOSAL OF UNCOLLECTED GOODS. H.M.S.O., 3d.
Bill presented in House.

HEATING APPLIANCES. H.M.S.O., 3d.
Bill placed before House.

FUEL RESEARCH. H.M.S.O., 2s. 6d.
Reports of Board and Director of Fuel Research for period April 1, 1949, *to December* 31, 1950.

BRITISH STANDARDS
B.S.37: *Electricity Meters—Parts* 1 *and* 2. *General clauses applicable to all types of motor meter and special requirements for single-phase 2-wire whole current credit type meters.* B.S.921: *Rubber Mats for Electrical Purposes.*

EXPORT LICENCE. COPPER GOODS. (*See page* 454) H.M.S.O., 2d.

NEW TROLLEYBUSES FOR ADELAIDE

SOME of the 30 new single-deck trolleybuses have now been put into service on new routes in Adelaide, S. Australia. The additional vehicles were ordered from the Sunbeam Trolleybus Co. in 1950, and were shipped to Adelaide as chasses, complete with electrical equipment supplied by the British Thomson-Houston Co., Ltd. The bodies have been built in Adelaide.

The electrical equipment includes a motor with a one-hour rating of 115 h.p. on 550 V. This is of a compound-wound non - regenerative type and stabilised rheostatic has been provided. It is designed to maintain a speed of 16 m.p.h.

Usually when these vehicles have a front entrance, control panels are mounted on the chassis or at the rear, but in this instance it has been possible to arrange for the panels to be in the cab. This, of course, gives improved accessibility and simplified maintenance.

These buses are very similar to the 80 which have been supplied and which are now in service in Perth and Brisbane, all with B.T.H. equipment.

One of Adelaide's new trolleybuses

CITY COMPTROLLER AT BATTI-WALLAHS

PRINCIPAL guest at the Batti-Wallahs luncheon last week was Mr. Desmond Heap, LL.M., L.M.T.P.I., Comptroller and City Solicitor to the Corporation of London. In a most interesting talk he described the manner in which local government as we know it had come into being. He was naturally more interested in the City of London, which had a Corporation by prescription having possessed a local government from immemorial time. His anecdotes and description of ceremonies and traditions were both amusing and impressive.

On the general question of local government, he thought that the central authority—the parliamentary government—was taking over too large a part.

Export of Motors

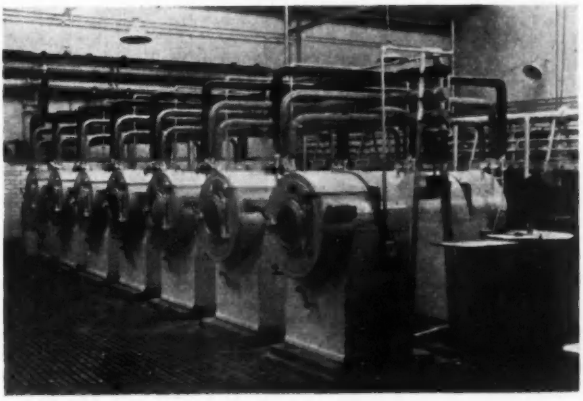
A REVIEW of the activities of Brook Motors, Ltd., during the past twelve months reveals that their exports of motors and control gear have been maintained. Direct exports, we understand, accounted for 35% of the company's total output of 280,000 while a further 40% were exported with all manner of British-made machinery. Reports from all parts of the world indicate the progress being made, Australia and New Zealand being among the more prominent customers. A ready market has been found in the U.S. and Canada and even turbulent Asia's demand has increased.

New Machines for City's Wash-houses

MANY of the worries attached to the weekly family washing day have been overcome in Liverpool by the re-equipment of the city's public wash-houses. Housewives patronising these buildings can now book a modern washing machine, take the family wash along and complete their arduous tasks inside the hour. The latest re-equipped wash-house (the tenth) was that in Speke Rd. where the 42 hand wash stalls have been replaced by modern appliances.

The City Council embarked on their programme of mechanisation about three years ago and expects to complete it by the summer when some 208 washing machines and 46 dryers will have been installed.

An almost identical installation to the one at Speke Rd. is that carried out in the Clare St. wash-house and depicted in our accompanying illustration. In that instance, 14 washing machines and four hydro-extractors have been fitted, the former being of the open-end type and made by D. and J. Tullis, Ltd., of Clydebank. Each has a capacity of 5.7 cu. ft. and is capable of handling 26 lb. dry weight per load. The hydro-extractors were manufactured by Thos. Broadbent and Sons Ltd., and driven by a 3 h.p. totally-enclosed motor. The installation was carried out by McBride and Nuttall, Ltd.



The scene in Liverpool's Clare Street public wash-house where manual wash stalls have been replaced by modern electrical washing machines as part of the Corporation's programme of re-equipping all those public buildings

Scheme for Inter-Factory Help in Wartime

A SCHEME whereby neighbouring factories will help each other in the event of their sustaining damage in wartime is being planned by the Ministry of Supply. Industrial representatives in areas containing a number of works of importance in war are being invited to form small self-help panels to assist one another with labour, materials, plant and other facilities. These panels will be formed by the Regional Controllers of the Ministry in their respective areas.

The main task of carrying out repair work to war-damaged factories will be borne by the Works and Buildings Emergency Organisation, but the voluntary system of self-help envisaged should provide for immediate first-aid from the panel members' own resources. This arrangement, it is hoped, will enable factories to resume production in a very short time.

GIFTS TO E.I.B.A.

RECENT gifts received by the E.I.B.A. include a cheque for £350 and sundry items of use to the elderly folk at their home at Broome Park, Betchworth. The £350 was subscribed as a result of the second annual ball organised by the Hants and Dorset branch of E.I.B.A. and the Southern Division of B.E.A., which took place a short time ago at Southsea. Some 500 people were present on that occasion and their donations represent an increase of £70 on last year's contribution.

At Broome Park, the residents are the richer for two radios sent them by R. G. E. Mayo of the G.E.C. and L. Bentley-Jones of Ferguson Radio Corporation, a toaster donated by F. W. Douglas of Morphy-Richards, cigarettes by D. G. E. Barrie and the staff of Metway Electrical Industries and an Electrical Handbook given by J. A. Crabtree and Co.

U.S. Instrument Talks

IN order to co-ordinate its activities with those of similar organisations and prevent conflicting arrangements, the Instrument Society of America has fixed the dates and venues of the national conferences until 1956. This year it is to be held at Cleveland between September 8 and 12, in 1953 at Chicago from September 21 to 25, in 1954 at Philadelphia from September 13 to 24, in 1955 between September 12 and 16 at Los Angeles and in 1956 from September 10 to 14 at Detroit. The ninth conference in 1954 is notable because the dates include the first international instrument congress and exposition.

HUMIDITY IN AIRCRAFT

TWENTY humidifying units designed to provide a comfortable atmosphere in the pressurised cabins of airliners flying at high altitudes are being supplied by the G.E.C. for installation in Bristol "175" aircraft. Steam from the electrically heated boiler of the unit may be fed into the air supply at any convenient point, and the unit is controlled so that it operates when relative humidity falls to 25% and cuts out when it rises to 60 or 70%. The boiler has ten pocket tubes each accommodating a 750 W cartridge type element.

The first of fourteen 1,070 h.p. 3,000 V. d.c. Metrovick electric locomotives being loaded at Liverpool for shipment to Rede Mineira de Viacao, Belo Horizonte, Brazil. It is a 50-ton, 4-axle mixed traffic loco, built at Metropolitan-Vickers - Beyer, Peacock Works, Stockton-on-Tees

MIDDLESBROUGH T.V. DISPUTE

ACCORDING to one member of the town council, the only way to bring television within the reach of all the people in Middlesbrough is by the adoption of a relay service. There is, however, some dissension in the town concerning the proposal to relay a service. In spite of the General Purposes Committee's decision to recommend the acceptance of Rediffusion's offer to install and operate the service, the Borough Treasurer is opposing the plan because he maintains Middlesbrough is entitled to "a better offer." The company's terms are payment of wayleave easements to the Corporation at 1s. a year per house and a guaranteed minimum income in wayleave and rates of £2,000 each year. The service is estimated to cost tenants about 10s. a week.

News in Brief

The Minister of Supply has increased the controlled maximum prices of nuts and bolts. The order took effect as from February 27.

Liverpool Corporation are to make a film on subject of malicious damage to street lamps.

Dorman and Smith Ltd. are to give four further demonstrations of their miniature circuit-breaker in Glasgow on March 18 and 19.

Mr. G. B. Young of the N. of Scotland Board and Miss M. J. Cumming, of S.W. Scotland Board, have won the men's and women's classes in the Scottish area finals of E.D.A.'s public-speaking competition. National finals will be in London in April.

Liverpool Electric Cable Co., Ltd., held their annual staff dinner in Liverpool recently.

Questions in Parliament . . .

Domestic Tariffs

Discriminatory charges, based on the number of rooms of a house rather than on the amount of electricity consumed, should not be made, asserted Mr. Philip Bell in the House last week. The Member wanted to know what general directions the Minister would give to the B.E.A. to prevent such a situation. Mr. Geoffrey Lloyd stated, however, that he did not intend to issue any directions, giving as his reason the fact that domestic tariffs had for many years contained an element varying in accordance with the size of the house, the number of rooms, or the rateable value.

Steel to save Coal

In a written answer last week, the Minister of Fuel and Power said he was considering measures whereby priority would be given to supplies of steel destined for the manufacture of plant and machinery which was likely to result in the more efficient use of coal.

House Heating

On Tuesday of last week, Mr. Nabarro asked the Minister of Housing and Local Government if he would introduce legislation that would enable him to require the installation of only approved domestic fuel appliances in all new housing construction; and what steps he would take to substitute approved gas space-heating appliances instead of electric space-heating appliances. In his reply the Minister indicated that all that could be done by way of persuasion and advice was already being done. He did not propose to advise people to have a gas space-heating appliance instead of an electric space-heating appliance.

Nationalised Industries

Replying to a questioner who asked if he would consider appointing a committee to investigate all undertakings which have been nationalised for seven years or more, the Prime Minister indicated that he thought it would be unwise to lay down any fixed formula for the review of nationalised industries.

Load Spreading

On Thursday last, Sir Walter Monckton, the Minister of Labour, stated that excellent results had been achieved this winter in industrial load spreading. The Electricity Sub-committee of the Joint Advisory Committee had been reviewing the position, and had recommended that regional boards for industry should have discretion to relax load spreading arrangement as from March 1. This recommendation had been accepted by the Government.

The need remained for full use of private generating plant and for economy during peak hours by all classes of consumer. In a supplementary question, Mr. Noel-Baker pressed for load spreading in the winter months to remain a national policy, probably for many years to come, while Mr. Gerald Nabarro advocated a realistic reform of the B.E.A.'s tariff.

Post Office Unions

Mr. Gammans, the Assistant Postmaster-General, was asked last week about the attitude of his department to the recent report of the Terrington Committee on "Trade Union Recognition within the Post Office." He replied that the P.M.G. had asked interested associations to furnish him with any written comments which they might care to offer. He did not think that he should comment on the report until a thorough examination of it had been possible.

Factory Inspectors

In a written reply, the Minister of Labour and National Service said that 26 factory inspectors were appointed in 1950 and 12 from the first competition in 1951, while 16 candidates at the second 1951 competition were offered appointments. Four of the candidates appointed in the two years were university graduates in chemistry, physics or engineering. Twenty-nine more inspectors were needed to bring the inspectorate up to full strength.

Scientists and Technologists

Sir Arthur Salter, replying for the Chancellor of the Exchequer, indicated in a written reply on Thursday that in the academic year 1950-51 the number of scientists and technologists coming from universities and technical colleges of Great Britain, with degree qualifications or their equivalent, was about 1 in 3,000 of the population.

Resale Price Maintenance

On Thursday, Mr. P. Thorneycroft said that he was not yet ready to make any statement on the action he intended to take on the recommendations of the Committee on Resale Price Maintenance.

Census of Production

Asked to postpone the completion date for Census of Production Form 330, recently issued to the electrical engineering trades, the President of the Board of Trade refused. He said that most firms found the time allowed for completion sufficient. In the few cases where extension of time was required for special reasons, the Census of Production Office always considered the request sympathetically.

B.E.A. University Donation

Questioned on Monday about a donation of 5,000 guineas made by the B.E.A. and the Midlands Electricity Board to University College, North Staffordshire, Mr. Geoffrey Lloyd said, in a written reply, that he was informed that the donation had been made to assist research and study in electrical and related subjects.

Electric Supply News . . .

Durham

Power plans for North-West Durham include a £50,000 scheme to provide electricity to the new Greencroft Trading Estate at Annfield Plain. Work is now being carried out by the North-Eastern Electricity Board who estimate to spend also £40,000 on a programme for improving their services at Dipton, South Stanley and Crookgate. The power load in this area has increased considerably during the past few years and little major work was carried out before nationalisation.

Exeter

Further criticism of the South Western Electricity Board's new tariff was made at last week's meeting of the Exeter Chamber of Commerce, when Mr. A. L. Keet, the Board's district manager, was present. He had been invited to answer questions about the new industrial and commercial tariffs now in force in the South-West which, so members said, increased their bills by 58 per cent., 80 per cent., and 125 per cent. Mr. Keet pointed out that up to the end of last year pre-war charges for power were still operating in the area, though the price of coal for power stations had risen three and a half times, the price of materials three times, and the cost of wages had more than doubled. He agreed that the cost of rural development had been higher than in some areas. After discussion it was agreed to ask the Consultative Council to propose that the limit under the "G" tariff, an interim one advised for firms using not more than 50 kW, should be raised to 70 or 75 kW.

Houghton-le-Spring

The U.D.C. has received a letter from the Area general manager of the Durham Divisional Coal Board regarding complaints that non-miner electricity consumers taking supplies from the network owned by the Coal Board were charged more for their electricity than miners. The Coal Board states that prices of supplies to miners were governed by agreements with the National Union of Mineworkers. Possible variations of these agreements were in course of negotiation. The Coal Board added it was under an obligation to transfer its electricity network eventually to the Electricity Board. The Urban Council has expressed the hope that the transfer will not be long delayed and that improvements will be made to remedy the abnormally low voltage. Consumers at present were unable to install electrical accessories because the system was overloaded.

Kintyre

The first English Electric 1,000 kW turbo-alternator in the power station near Gartgreillan, in the Glen Lussa hydro-electric scheme, is now in operation and is supplying power to Kintyre. Insallation of a second similar Francis machine is also well advanced.

N. Wales

Up to December 31 last, 21 rural electrification schemes in North Wales had been completed, it was stated in a progress report prepared for the North Wales area electricity consultative council. The schemes covered the counties of Anglesey, Denbigh, Flint, Montgomery, Merioneth, Cardigan, and Caernarvon and parts of Shropshire and Cheshire. Since the inception of the North Wales development scheme the consumers connected up to December 31, were 1,879 domestic, 546 farms, 255 commercial, and two industrial—2,682 in all.

Tummel-Garry

Within the next few days a further stage in the North of Scotland Hydro Electric Board's Tummel-Garry scheme will be completed, when the junction is made between the two teams drilling the tunnel from Errochty dam down to Loch Tummelside. The tunnel, about six miles long, is the longest yet driven for the Board.

LIGHTING SCHEMES

Ashton-under-Lyne.—T.C. recommended to approve improved lighting of Manchester Road, at a cost of £3,885.

Bridgnorth.—T.C. has received sanction to borrow £5,000 for electric street lighting for Class "A" roads.

Coventry.—It is proposed that street lighting be installed at Tile Hill neighbourhood unit, Bell Green unit and Fletchamstead Highway estate, by direct labour at a cost of £22,612.

Doncaster.—The Watch Committee has approved schemes for improved lighting in St. James's Street, Cleveland Street, Silver Street and Market Road, at a cost of £3,235. A scheme for sodium lighting in Dawtry Road, at a cost of £2,500, is also under consideration.

Kelso.—T.C. to erect 134 electric light standards, to complete the scheme for the town.

Mansfield.—T.C. has received approval to borrow £2,940 for electric street lighting on three estates.

Margate.—The T.C. has approved in principle an £11,155 scheme for improved lighting of several roads. The work is to be spread over three or four years.

Skelmersdale.—The U.D.C. is to submit to the C.C. a scheme for class A lighting in Ormskirk Road. The council has also accepted a recommendation for the early conversion of other roads to electricity.

W. Lancs.—The R.D.C. has approved a street lighting scheme estimated to cost £4,005.

Wigan.—A sub-committee has recommended the conversion of lighting in Warrington Road (cost £1,794), Woodhouse Lane (£2,415), Whelley (£2,760) and Billinge Road (£1,300).

Company Activities . . .

Associated Electrical Industries Ltd.

An increase of £1,881,000 in the consolidated trading balance for 1951 compared with 1950, is recorded in the preliminary statement. The balance total stands at £10,321,000 (*£8,444,000*). The final Ordinary dividend is again 12½%, making 20% (*same*). This dividend recommendation is in respect of £6,652,947 of Ordinary stock in issue prior to the recent offer of 2,217,649 new Ordinary shares which do not rank for any dividend paid in respect of 1951. Into the normal depreciation allocation, £880,000 (*£810,000*), a further sum of £1,250,000 has been charged, before arriving at the profit for the year, towards the increased replacement costs of fixed assets. There is £128,000 (*£5,000*) written off trade investments, etc., and £148,000 (*£243,000*) set aside as provisions, leaving a balance of £7,924,000 (*£6,456,000*). Taxation absorbs £5,400,000 (*£3,960,000*), leaving a net profit of £2,524,000 (*£2,496,000*).

Bruce Peebles and Co.

This old established concern reports another good year with slightly increased profits for 1951, and a higher Ordinary dividend. After providing £180,000 (*£120,000*) for taxation, the net profit amounts to £123,922 compared with £112,879 for the previous year. There is a Preference dividend of 7½%, plus further payment (contingent on profits), making 10%, also a first and final Ordinary dividend of 15% (12½%). The sum of £15,597 (*£13,277*) is placed to depreciation. With £10,295 (*£15,724*) brought in and tax provisions not now required £10,000 (*nil*), there is £128,620 available.

Clarke, Chapman and Co.

Net profit for 1951 is £182,545 (*£178,508*), after charging taxation of £183,107 (*£144,436*) and allocating to replacement of fixed assets, etc., reserve £40,000 (*same*), deferred repairs etc. £13,381 (*£23,736*) and provision for development expenditure of subsidiary companies £13,000 (*nil*). The Ordinary dividend is again 15%.

English Electric Co. Ltd.

The preliminary statement shows the group profit for 1951, after all charges including taxation, is £1,355,530, compared with £1,101,022 for the previous year. In arriving at this figure, taxation of £2,286,611 (*£1,896,328*), and depreciation at £934,645 (*£848,818*) is charged. The authorised capital is to be raised by £2 million Ordinary to £10 million, but no further issues are at present contemplated.

General Electric Co.

Under the recent rights offer to Ordinary stockholders, acceptances totalled 90·6% of the 1,679,348 £1 Ordinary shares offered. Applications for additional shares were considerably in excess of the balance, and allotments have been heavily scaled down.

Marconi's Wireless Telegraph Co. Ltd.

Profit of the company and its wholly-owned English subsidiaries for 1951, after all charges, including taxation, is £159,667, compared with £164,309 for 1950, according to the preliminary statement. U.K. taxation of £171,714 (*£82,582*), depreciation of £73,862 (*£52,141*), and to depreciation equalisation reserve £25,000 (*£35,000*), is charged. Dividends already announced absorb £83,428 (*£87,400*).

Marconi International Marine Communication Co.

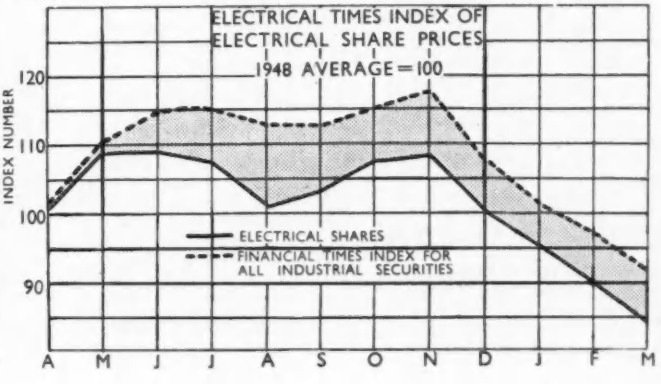
For 1951, the profit of the company and its wholly-owned English subsidiaries is £138,276, compared with £111,702 for the previous year, after all charges, including taxation.

Dividends Declared

Alfred Herbert Ltd.—Final Ordinary dividend of 5% tax free on capital increased by 200% bonus issues.

Mather & Platt.—Final Ordinary dividend of 6%, plus bonus 2½%, making 12½% (*same*).

Ransome & Marles Bearing Co.—Interim of 7½ (*same but on smaller capital*).



Although not quite as sharp in January, share prices fell again last month. The indices for both industrial shares as a whole and electrical shares in particular maintaining almost parallel declines—the former being slightly the less marked. The "Electrical Times" index for electrical shares fell by 5·0 to 84·4, while the "Financial Times" figure for all industrial shares dropped from 97·6 to 93·9. Figures are based on average prices prevailing during 1948

Commercial Information

CONTRACTS OPEN

HOME

Mar. 7.—West Lothian. Electrical work in construction of eight shops and six houses at Fivestanks, Broxburn, John Calder, County Clerk, County Bldgs., Linlithgow.

Mar. 8.—Banbridge (Down) R.D.C. Lighting installations in 48 houses on four sites of 12 each. D. W. Chambers, Architect, Town Hall. Deposit £2 2s.

Mar. 8.—Duns T.C. Electrical work in erection of 38 houses in Brierybaulk scheme. Applications for inclusion in list of contractors to Wm. Renton, town clerk, Burgh Chambers, by above date.

Mar. 10.—Aberdeen. Electrical work in erection of branch bank and houses in Traill St., Thurso, for Aberdeen Savings Bank. Jenkins and Marr, architects, 3 Bon-Accord Crescent.

Mar. 10.—Doncaster T.C. Provision of electrical installation in 54 houses on Cantley estate. Borough Architect, 15 South Parade. Deposit £1.

Mar. 10.—Manchester. Installation of 17·5 cwt electric passenger lift at "Newholme," West Didsbury. City Architect, Town Hall. Deposit £1 1s. (See Feb. 28 issue.)

Mar. 10.—Newcastle-on-Tyne. Supply, laying and jointing of electric cables at Tyne Dock, South Shields, for Tyne Improvement Commission. Documents from Commission's secretary, J. K. McKendrick, Bewick St., Newcastle. Deposit £1 1s. (See Feb. 21 issue.)

Mar. 10.—Sheffield. Supply and erection of pumps and all necessary motors, switchgear, etc., for sewage pumping station at Low Edges. City Engineer and Surveyor, Town Hall. Deposit £2 2s.

Mar. 10.—West Riding. Installation of electricity at Wetherby secondary school. County Architect, "Bishopgarth," Westfield Rd., Wakefield.

Mar. 10.—Whittingham. Hospital Management Committee (near Preston) require supply of electric lamps for year ending Mar. 31, 1953. Secretary of Committee is W. A. Higgs.

Mar. 11.—East Riding. Installation of electrical services at Withernsea secondary school. Applications to County Architect, County Hall, Beverley (See Jan. 24 issue.)

Mar. 12.—Castle Ward R.D.C. Electrical installation in 92 houses at Ponteland. G. Edgar-Dimmack, Engineer and Surveyor, North Rd., Ponteland. Deposit £2 2s.

Mar. 12.—Clutton (Som). R.D.C. Electrical installation in 24 houses at Chew Stoke and eight at Ubley. Architects, Thomas and Morgan and Partners, 23 Gelliwasted Rd., Pontypridd. Deposit £1 1s.

Mar. 12.—Fife. Electrical work in erection of garage at Police Divisional Headquarters in Abbey Park Place. Surveyors, Wilkinson and Lowe, 2a Chalmers St., Dunfermline.

Mar. 12.—Huddersfield T.C. Supply, erection and maintenance of electrically driven booster pumping plant at Thongsbridge. Waterworks Engineer, 24 Ramsden St., Huddersfield. Deposit £1 1s.

Mar. 12.—Southport T.C. Installation of electric lighting and heating in erection of 39 houses on Heathfield Rd. estate. Borough Architect and Town Planning Officer, Pavilion Buildings, Lord St. Deposit £1 1s.

Mar. 13.—Stornoway T.C. Electrical works in construction of 24 houses on Leverhulme Drive site. Names by above date to Gratton and Maclean, Chartered Architects, 21 Woodside Terrace, Glasgow.

Mar. 14.—Belfast. Electrical alterations and additions at Central Chest Clinic, Durham St., for N. Ireland Tuberculosis Authority. Deposit of £5 5s. to W. Harvey, Secretary, 27 Adelaide St., Belfast. Documents may be had on production of receipt from J. R. W. Mutland, Consulting Engineer, 13 Wellington Place, Belfast.

Mar. 14.—Bristol. Supply of electric lamps and batteries. Central Purchasing Dept., 2 Upper York St., St. Paul's, Bristol.

Mar. 14.—Dublin. Installation to be carried out at service station, Santry, for McCairns Motors Ltd., includes lighting inter-com. system, power, cooking installation and main switchgear. Varming and Mulcahy, consulting engineers, 62 Merrion Sq. South, Dublin. Deposit £10 10s.

Mar. 17.—Eccles T.C. Provision and installation of 77 400 W mercury units comprising concrete columns, lanterns, lamps, condensers, chokes, time-switches, etc., in Worsley and Barton Rds. Borough Engineer and Surveyor, Town Hall.

Mar. 17.—N. Ireland. Supply of electric lamps to Coleraine and Portrush Hospital Management Committee for year beginning April 1. Documents from Secretary of Committee, Bann View Hospital, Coleraine.

Mar. 18.—Dublin. Electrical heating installation at Griffith Barracks. J. Tyrrell, Secretary, Office of Public Works, Dublin. Deposit £1.

Mar. 18.—Manchester. Electrical work in 34 houses on various sites. Director of Housing, Town Hall.

Mar. 19.—Gosforth U.D.C. Provision and erection of 53 Group A and 33 Group B lighting units. Clifford Wyld, Engineer and Surveyor, Council Chambers, High St. Deposit £1 1s.

Mar. 19.—Hull. Electrical installation to Barham secondary modern school on Bilton Grange estate. City Architect, A. Rankine, Guildhall. Deposit £1 1s.

Mar. 19.—Walthamstow B.C. Supply of (*a*) one 30 W a.c. mains amplifier with switch panel to control four microphone circuits; (*b*) three-ribbon high-velocity microphone heads with telescopic stands and 15 yd insulated screened cable; (*c*) two sound columns. W. A. Doig, Deputy Borough Engineer and Surveyor, Town Hall, Forest Rd., E.17.

Mar. 22.—Kildare. Supply and installation of two direct drive electrically propelled pumps, including wiring, starters, switches, etc. Consulting Engineer, Nicholas O'Dwyer, 6

Burlington Rd., Dublin. Deposit £5 5s.

Mar. 22.—Bromsgrove U.D.C. Supply of 114 electric cookers and washboilers to Charford Estate. Engineer and Surveyor, Council House.

Mar. 24.—Huddersfield T.C. Supply and erection of electrically driven booster pumping plant at Thongsbridge. Waterworks Engineer, 24 Ramsden St. Deposit £1 1s.

Mar. 24.—Manchester. Installation of electricity required at Rosebank, Mersey Rd. City Architect, Town Hall. Deposit £1 1s.

Mar. 31.—Blackpool T.C. Electrical installation in erection of St. Paul's infants school. Applications by above date to Arthur Hamilton, Borough Surveyor, Municipal Buildings.

Mar. 31.—Newark T.C. Supply of (a) 132 concrete columns and four wall brackets, wiring and installation of street lighting, and (b) 400 W mercury lighting equipment along 5,500 yd of trunk roads A1 and A46. Borough Surveyor, Municipal Buildings, Balderton Gate. Deposit £2 2s. (Advertised in this issue.)

No date stated.—Inverurie. Electrical installation in erection of 10 houses on Glebe site for Scottish Veterans' Garden City Association. Applications to J. H. Chilcott, Secretary, 5 Manor Place, Edinburgh.

OVERSEAS

Details of items marked • may be obtained on application to Room 1076, Board of Trade, Horseguards Avenue, S.W.1, quoting reference.

Mar. 17.—South Africa. Supply of 2,000 single-phase a.c. house service meters rated at 10 amp suitable for 220 V 2 wire a.c. 50 c/s system; and 1,000 three-phase a.c. meters at 15 amp for 380/220 V 3-phase 4 wire a.c. 50 c/s system. City Electrical Engineer, Electricity Dept., Electricity House, Strand St., Capetown. B.o.T. (Ref. CRE 8092/52).•

Mar. 18.—Pakistan. Supply of 200 kW and 400 kW generating sets. Documents available from Commercial Secretary, Supply and Stores Dept., 40 Lowndes Sq., London S.W.1. Ref. S.D.D. No. 102/GS. Deposit 5s.

Mar. 20.—Egypt. Supply of 60 transformers of 300 kVA output, 40 of 450 kVA and 10 of 400 kVA, for Cairo Electricity and Gas Administration. Documents from Chief Inspecting Engineer, Egyptian Govt. 41 Tothill St., S.W.1. Deposit £2 1s. (See Feb. 21 issue. Latest date for receipt of tenders postponed from Mar. 5.)

Mar. 24.—Uruguay. Supply of machine tools, namely planing machine with adjustable stroke, high-speed lathe, a lathe of large revolution and hydraulic press, actuated by electric motors designed for 3-phase a.c., 200 V, 50 c/s supply. Administracion Nacional de Combustibles, Alcohol y Portland. B.o.T. (Ref.: CRE 5728/52)•.

Mar. 30.—Persia. Ministry of Post, Telegraph and Telephones invites tenders for electrical equipment for Teheran Radio station, including switchboard synchronising indicator and cable. (Ref. CRE 6658/52).•

April 15.—India. Supply and installation of travelling portal crane powered by electric motors controlled from a cab on the crane. Damodar Valley Corpn., Anderson House, Alipore, Calcutta. B.o.T. (Ref. CRE 7169/52).•

April 16.—Uruguay. Usinas Electricas y Telefonos del Estado, Paraguay 2431, Montevideo, require 50,000 lightning conductor carbons. B.o.T. (Ref. CRE 7275/52).•

April 21.—Uruguay. Supply of equipment for transformer substations and material for extension of Southern Branch of Western Circuit up to Colonia. Administration general, U.T.E., Paraguay 2431, Montevideo. B.o.T. (Ref. CRE 5935/52).•

CONTRACTS PLACED

Lowestoft T.C. Electrical installation in 50 houses on Whitton estate, Eastern Electricity Board, £1,196.

Luton T.C. Installation of electricity in six blocks of flats on Farley Hill estate, Williams and Richardson Ltd., £3,033; supply 72 water heaters to same, Alliance Wholesale Ltd., £2,534.

Manchester. Supply of auxiliary equipment for 250W high pressure mercury lamps for street lighting, Wardle Engineering Co. Ltd.; electrical work in **31** houses on Bank estate, E. M. Evans and Son Ltd.

Middlesbrough T.C. Electrical work for stage two of Stainsby secondary school scheme, Steels Engineering Installations, £16,046.

Newcastle. Electrical installation at Stocksfield Ave. primary school, Devereux Moodie and Co. Ltd., £5,568; same at Denton Sq. primary school, R. V. Hogg and Co., £6,552.

Ramsbottom U.D.C. Supply and erection of equipment for installation of 140 W sodium lighting scheme along trunk roads A.56 and A.676, Crompton Parkinson Ltd., £4,781.

Southport T.C. Lighting and heating installations in 44 houses on Heathfield Rd. site, Morris Bros. Estates (Southport) Ltd., £1,026.

Your Queries — Answered

"Triumph" hairdryers, suppliers of? L.E.—These were supplied by A. Marien, 73 Highbury New Park, N.5. (22236)

"Trojan" hairdryers, makers of? M.E.—They were made by John Shaw & Sons Tools Ltd., Fourth Avenue, Bushbury, Wolverhampton. (22252)

Solvents for P.V.C., makers of? M.S.—Imperial Chemical Industries Ltd., 149 Park Lane, W.1. Hopkin & Williams Ltd., Freshwater Rd., Chadwell Heath, Essex. (22268)

"Morley" gas-heated, electrically-agitated washing machine, makers of? C.W.—Morley Products (Padiham) Ltd., Victoria Works, Padiham, Lancs. (22275)

"Rubo" accessories, makers of? T.E.—Gerald Stains Ltd., Puttridge Works, Gloucester Rd., Ross-on-Wye. (22247)

Solid copper staples to take ⅜ in. and ½ in. copper wire, makes of? R.F.—Try: Metway Electrical Industries Ltd., King St., Brighton. Busby & Co Ltd., Price St., Birmingham 5. Joseph Nichols & Son Ltd., Cheapside, Birmingham 12. (22261)

The above are selected from questions we have answered this week. If you have a query, send it to us.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2

Langstone Engineers, Ltd., New Cottage, Catsash, Langstone, Mon. Agricultural, mechanical, motor, electrical and general engineers, etc. Nom. Cap.: £100. Permt. mang. dir.: C. W. Morgan.

Moyle and Johns (Engineers) Ltd., 93 Meneage St., Helston, Cornwall. Electrical engineers, general electrical installation contractors, etc. Nom. cap.: £10,000. Dirs.: F. G. Moyle (permt. mang. dir.) and Mrs. W. Moyle, and G. S. Johns.

W. L. Pitcher, Ltd., 304 Cheriton Rd., Folkestone, Kent. Electrical contractors and engineers, etc. Nom. cap.: £4,000. Dirs.: Mrs. E. L. Pitcher, and W. P. Yates.

Selecta Portable Electric Tools Ltd., 116 Victoria Rd., N.W.10. Nom. cap.: £500. Dirs.: J. Frye, and E. A. Elmore.

Somnolux Electrical Products Ltd. Manufacturers of and dealers in electrically heated blankets, pads, etc. Cap.: £5,000. Dirs.: to be appointed by subs. Subs.: G. T. Jones, 3 Fairfax Drive, Wilmslow; and W. E. Platt, Southwood, Church Rd., Lytham.

Sucal International Trading Ltd. To act as trading agents for and on behalf of Suchy Holdings, Sucal Ltd., Chemring Ltd., Suchy Division Inc., New York, Dowsing Co. (Electrical Manufacturers) Ltd., and other affiliated companies, etc. Cap.: £1,000. Dirs.: C. T. Suchy, Amberlands, Kingston Hill, Surrey; H. E. G. Richards, Ibsley Grange, Ibsley, nr. Ringwood, Hants, and J. Dootson.

Thermostatic Mixing Valve Co. Ltd. General, mechanical, electrical and motor engineers, etc. Cap.: £100. Dirs.: to be appointed by subs. Subs.: H. W. Hollands, Roman Way, Little Aston Park, Streetly, Staffs., and D. W. James, Royston, Blackroot Rd., Four Oaks, Worcs.

A. A. Thomas (Insulations) Ltd., 249a Burdett Rd., E.14. Refrigeration and cold storage engrs., thermal and insulation acoustics, etc. Cap.: £5,000. Dirs.: A. A. Thomas, J. D. Coughlan and H. W. Morgan.

Unida Products Ltd., 51 The Mall, Ealing, W.5. Manufacturers of and dealers in sprayguns, vacuum cleaners, etc. Nom. cap.: £100. Dir.: G. Patterson.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	227 0 0	£220 0 0
LEAD, good soft pig (foreign)	170 0 0	152 0 0
" " " "English" quality ...	171 10 0	
Tin (99-99·75%) ... ...(Cash)	975-976	—
" (3 months)	974½-975½	—
ALUMINIUM, commercial purity (del.)	148 0 0	—
ZINC	190 0 0	156 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	59 10 0	—
Mild Steel Tape (0·04 in.)	39 15 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Blaenau Electrical Supplies Ltd. General meeting to take place at Electricity House, Love Lane, Pall Mall, Liverpool, on Mar. 31 at 11 a.m. to receive liquidator's report.

Camley Engineering Co. (1951) Ltd. Resolution passed for voluntary winding-up at meeting on Feb. 18 when Cyril Sheard, 87 Cookridge St., Leeds, was appointed liquidator.

Domestic Repair Services of Dukinfield. Partnership between Bernard Wetherell and Harold Sellars (electrical sales and service business) dissolved as from Jan. 21. Debts received and paid by H. Sellars who will continue business.

Henfrey (Electrical) Ltd. Meetings of creditors and members will take place at Alabaster, Stray and Clogg, 48 Cannon St., E.C.4, on April 16 at 2.30 p.m. and 3.30 p.m. respectively to receive liquidator's report.

Lincoln Electric Welding Works (Nottingham) Ltd. Meeting of creditors to be held at Prior and Palmer, Bridlesmith Gate, Nottingham, tomorrow (Friday) at 12 noon.

Stockdill's Ltd. Resolution passed at meeting on Feb. 22 for voluntary winding-up. Edward V. Balmford, C.A., 15 Station St., Huddersfield, has been appointed liquidator.

BANKRUPTCY ACTS

First Meetings

Bradford. Thomas Duckett Long, trading as T. D. Long, electrical contractor at 664 Halifax Rd., Buttershaw, Bradford. At first meeting of creditors resolution passed for appointment of R. B. Smith, 3 Alfred St., Boar Lane, Leeds, as trustee. Statement of affairs showed liabilities of £3,253 against net assets of £447.

Barrow-in-Furness. Robert E Browne, electrical contractor, trading as Browne Bros. at 121 Market St., Dalton-in-Furness. First meeting at County Court Offices, Michaelson Rd., Barrow, on Mar. 6 at 11.30 a.m., and public examination at Magistrates Court, Lawson St., Barrow, on April 16 at 2.30 p.m.

Appointment of Trustee

Bradford. Thomas D. Long, trading as "T. D. Long," electrical contractor, at 864 Halifax Rd., Buttershaw. Trustee is R. B. Smith, 3 Alfred St., Leeds

Intended Dividend

Salford. Wilfrid E. Lawton, trading as "Lawton Bros.," dealer in refrigeration equipment at 36 Lr. Broughton Rd., Salford. Last day for receiving proofs, Mar. 14. Trustee is F. C. Ormrod, Official Receiver, 20 Byrom St., Manchester.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Apollo, with design. 702 867. Class 9. Radio-gramophones, wireless and television sets, etc. J. B. Manufacturing Co. (Cabinets) Ltd., 86 Palmerston Rd., Walthamstow, E.17.

Dowmic. 704,040. Class 9. Electrical switchgear. Dowty Equipment Ltd., Arle Court, Cheltenham, Gloucester.

Healadex. 702,913 and **Healasol.** 702,914. Class 10. Electromedical curative apparatus and appliances. Heala (Electro Medcal) Ltd., Cherry St., Woking, Surrey.

Sternette Flexotray. 703,402. Class 11. Ice trays for domestic refrigerators. L. Sterne and Co. Ltd., 183-191 Palace Chambers, Bridge St., Westminster, S.W.1.

BUSINESS PROSPECTS

HOME

Aberdeen T.C. Layout plans approved for 1,250 houses at Mastrick and a further 174 on various other sites.

Aldershot. Application to be made for sanction to borrow £11,827 for erection of library.

Aycliff (Durham). Offices and administrative block proposed at Aycliff Hospital for Newcastle Hospital Board.

Beddington (Surrey). Additional school accommodation is to be provided at Royal Female Orphanage.

Blackpool T.C. Construction of infants' school on Mereside estate. Borough Surveyor, Arthur Hamilton, Municipal Buildings.

Brighouse T.C. Construction of 34 houses at Rastrick. Borough Engineer and Surveyor, H. A. Sneezum, Commercial Street.

Coventry T.C. It is proposed to build two neighbourhood units at Bell Green. Scheme includes some 768 houses and 364 flats.

Dartford T.C. Construction of block of shops with 16 flats over on Temple Hill Neighbourhood Unit. T. Armstrong, town clerk, Council Offices, High Street.

Daventry T.C. Erection of 36 houses on Bramston Rd. estate. Architect is F. A. Coles, Long Buckby, Rugby.

Droxford (Hants) R.D.C. It is proposed to erect 100 houses at Denmead and 80 at Bishops Waltham.

Edinburgh. Approval granted for erection of research laboratory at Glasgow Rd., Corstophine for National Coal Board.

Essex. Additions to be carried out at Colchester Priory St. school, Harwich county school and Clacton secondary school.

Falmouth T.C. Approval is being sought for erection of 228 houses, 68 flats and four shops in Dracaena Avenue.

Glasgow. City Engineer has been authorised to carry out renewal of electrical work in east and west galleries of Kelvingrove Art Galleries, at estimated cost of £585.

Houghton-le-Spring U.D.C. Estimates approved for erection of 32 houses on Cellshill estate and 58 on Fence Houses estate; also 18 dwellings on other sites.

Huyton-with-Roby U.D.C. Erection of 80 houses on St. John's Rd. East site. H. K. Pilkington, Engineer and Surveyor, Council Office, Derby Rd., Huyton, nr. Liverpool.

L.C.C. It is proposed to invite tenders for installation of electricity in ten primary and secondary schools and one special school in first group of sixth programme.

Middlesbrough T.C. Erection of 94 houses at Berwick Hills, Borough Engineer, Municipal Buildings.

Montrose. Dean of Guild Court has approved erection of grain drier and store bins for J. M'Kenzie and Sons Ltd., Academy Park, Flour Mills.

North Shields. Bergen Steamship Co. Ltd., planning erection of passenger terminal on Tyne Commission Quay, at cost of £26,000. Work is expected to start soon. Architects are Edwards and Manby, 52 Eldon Place, Newcastle.

Oxfordshire. C.C. considering request by Bicester U.D.C. for erection of 800 houses to accommodate War Dept. workers.

Portsmouth. Erection of 102 houses at Paulsgrove. City Architect, Municipal Offices, 1 Weston Parade.

Rugby R.D.C. It has been proposed that a total of about 220 houses should be built on Long Lawford estate.

Scunthorpe T.C. Erection of 436 dwellings on New Brumby estate is being considered.

Slaithwaite (Yorks). Clayfield Oil Works belonging to J. Haigh and Co. Ltd., are to be rebuilt.

Staveley (Derby) U.D.C. Approval granted to lay out plans for housing estate to accommodate 300 dwellings.

Surbiton. Erection of R.C. primary school at Tolworth. Architect is Wilfrid C. Mangan, 2 Ribblesdale Place, Preston, Lancs.

Wetherby R.D.C. Erection of a total of 67 houses in five groups on Hallfield estate. Council's Architects, Needham, Thorp and White, 6 High Petergate, York.

Woking (Surrey). Plans approved for £46,511 primary school at West Byfleet.

OVERSEAS

Canada. D. B. Brett, Commission Agent, Monroe Building, Water St., St. John's, Newfoundland, would like to obtain agencies for electric kettles and irons. Latter should not be automatically or thermostatically controlled, and suitable for 110 V a.c. 60 c/s supply.

TRADE NOTES

Change of Address. The Acton Society Trust has moved to 39 Welbeck Street, W.1. Tel.: Welbeck 3404.

Another Extension. The extension of the factory of Bill Switchgear Ltd., adjacent to the present works in Aston Lane, Perry Barr, Birmingham, has been completed. This extension block of 3 floors, with subsidiary buildings, adds 30,000 sq. ft. of production space.

Another Factory. It is announced that the Government factory at Penygroes in the Nantlle Valley, has been let to Denis Ferranti Meters Ltd. It is anticipated that the company will take over the factory at the end of April, it is stated.

B.E.A.M.A. Newly elected members of B.E.A.M.A. are: John Rouse (Oldham) Ltd. (heavy duty cooking apparatus section); London Transformer Products Ltd. (transformer section); International Refrigerator Co. Ltd., and Venreco Ltd. (unattached members).

Expansion. Merchant Adventurers Ltd. have acquired a new factory and works in Portland Road, W.11.

E.W.F. The Kenwright Electrical Co. Ltd., 515 London Road, Thornton Heath, has been elected a member of the Electrical Wholesalers' Federation.

New Factory ? Manchester Corporation Estates Management Committee is today to consider proposals for the construction of a factory for Metropolitan-Vickers Electrical Co. Ltd. on a 40-acre site at Wythenshawe.

Norway Imports. From May 1 next, domestic washing machines may be imported unrestricted into Norway. Steam and water turbines are similarly listed.

Sales. The Quasi-Arc Co. Ltd., announce that as from April 1, sales and service of Unionmelt automatic welding plant, powder and wire will be transferred to their associated company, Fusarc Ltd., Team Valley, Gateshead-on-Tyne, 11.

MEETINGS TO NOTE

THURSDAY, MAR. 6

A.S.E.E. (S. London Branch).—Film evening and discussion at Café Royal, Croydon, 8 p.m.

INSTN. OF ENGINEERING INSPECTION (London).—"Glass in Engineering." P. M. Davidson. Royal Soc. of Arts, 6 p.m.

I.E.E. (London).—"Post-Graduate Activities in Electrical Engineering." W. J. Gibbs, D. Edmundson, R. G. A. Dimmick and G. S. C. Lucas. Savoy Place, W.C.2, 5.30 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (London).—Symposium of papers on church heating by (*a*) hot water, (*b*) gas, and (*c*) electricity. The last by E. M. Ackery. Instn. of Mech. Engrs., Storey's Gate, S.W.1, 6 p.m.

FRIDAY, MAR. 7

A.S.E.E. (Bristol Branch).—"Electricity in Agriculture." W. Cover, Grand Hotel, 7.30 p.m.

A.S.E.E. (Liverpool Branch).—"Cathode Ray Oscillograph as a Tool." Laboratories of Applied Electricity, Brownlow St., 7.30 p.m.

BIRMINGHAM ELECTRIC CLUB.—Thirty-fifth annual dinner at Grand Hotel, 6.30 p.m.

E.P.E.A. (Midland Tech. Group).—Paper on Productivity Team's visit to U.S. electric supply industry. M.E.B. Showrooms, Stoke, 7 p.m.

I.E.E. (E. Midland Centre).—Annual dinner at Victoria Station Hotel, Nottingham, 6.45 p.m.

I.E.E. (Mersey and N. Wales Centre).—Dinner dance at Reece's Restaurant, Parker St., Liverpool, 7 p.m.

I.E.E. (N. Staffs Sub-centre).—"Generation and Flow of Harmonics in Transmission Systems." S. Whitehead and W. G. Radley. Crown Hotel, Stone, 7 p.m.

I.E.S. (Bath and Bristol Centre).—"Sodium Lamps and Their Applications." A. W. Gostt. Elect. Showrooms, Old Bridge, Bath, 7 p.m.

I.E.S. (Huddersfield Group).—"Railway Signalling." G. G. F. Halliwell. Elect. Showrooms, Market St., 7.15 p.m.

INSTN. OF MECH. ENGRS.—"Use of Heavy Fuels for Medium-sized Marine and Stationary Diesel Engines." J. R. P. Smith. Storey's Gate, S.W.1, 5.30 p.m.

INST. OF FUEL (E. Midland Section).—"Power in the Future." Dr. J. Bronowski. Loughborough College, 7.15 p.m.

MANCHESTER ASSN. OF ENGRS.—"Tubular Structures." E. McMinn. Engineers' Club.

ELECL. COM. TRAVELLERS ASSN.—Annual luncheon. Connaught Rooms.

MONDAY, MAR. 10

I.E.E. (London).—Discussion on "Remote Measurement and Instrumentation." H. Horwood. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N.E. Centre).—"Economics of Low-Voltage Electricity Supplies to New Housing Estates." F. G. Copland. Neville Hall, Westgate Rd., Newcastle, 6.15 p.m.

I.E.E. (N. Ireland Centre).—"Economic Use of Small Sources of Water Power." Lt. Col. J. R. W. Murland. Queen's University, Belfast, 6.15 p.m.

I.E.E. (S. Midland Supply and Utilisation Group).—"Electricity Supply—Statistical Approach to Some Particular Problems." R. B. Rowson. Imperial Hotel, Birmingham, 6 p.m.

I.E.E. (Western Centre).—"Control of Hydro-Electric Plant." A. C. H. Frost and W. Brittlebank. Elect. Showrooms, Colston Ave., Bristol, 6 p.m.

A.S.E.E. (Central London Branch).—"Maintenance and Repair of Electrical Motors." D. R. Reekie. St. Ermins' Hotel, Caxton St., S.W.1, 7 p.m.

A.S.E.E. (N.W. London Branch).—"Automatic Power Factor Correction." James Orr. Prince of Wales Hotel, N.W.9, 7.45 p.m.

TUESDAY, MAR. 11

INCORP. PLANT ENGRS. (S. Wales Branch).—"High and Low Temperature Insulation Materials." Inst. of Engineers, Park Place, Cardiff, 7.15 p.m.

INSTN. OF ENGINEERING INSPECTION (Coventry).—"Precision Measurements." J. H. Hobbs. Tech. College, 7.30 p.m.

NEWPORT ELECTRIC CLUB.—"Application of Capacitors for Industrial Power Factor Correction." H. A. Jones. Tredegar Arms Hotel, 7 p.m.

I.E.E. (E. Midland Centre).—"Determination of Time and Frequency." H. M. Smith. Elect. Showrooms, Derby, 6.30 p.m.

I.E.E. (Cambridge Radio Group).—"Investigation into Mechanism of Magnetic-Tape Recording." P. E. Axon. Cavendish Lab 8.15 p.m.

I.E.E. (N.E. Centre).—Faraday Lecture on "Sound Recording—Home, Professional, Industrial and Scientific Applications." G. F. Dutton. City Hall, Newcastle, 7 p.m.

I.E.E. (N.W. Centre).—Annual dinner and visit of President. Midland Hotel, Manchester.

I.E.S. (London).—"Lighting in Shipyards." J. S. McCulloch. L.S.B., Savoy Hill, W.C.2, 6 p.m.

INST. OF FUEL (Midland Section).—"Modern Outlook on Refractory Materials." Dr. A. T. Green. M.E.B., Kingsway, Stoke, 7 p.m.

A.S.E.E. (Bolton Branch).—Business meeting and lecture at Balmoral Hotel, Bradshawgate, 7 p.m.

A.S.E.E. (S.W. London Branch).—"Voltage Regulators." E. M. Pendrill. St. George's Hall, St. George's Rd., Wimbledon, 8.15 p.m.

WEDNESDAY, MAR. 12

I.E.E. (London Students' Section).—Debate on "Railways No Longer Fulfil Transport Requirements of Country and Must Be Converted to Trunk Roads and Aerodromes." Instn. of Mech. Engrs., Gt. George St., S.W.1, 6.30 p.m.

I.E.E. (London Radio Section).—"Slot Aerial and Its Application to Aircraft," and "Survey of External and Suppressed Aircraft Aerials for Use in High-Frequency Band." R. H. J. Cory. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Midland Centre and Sheffield Sub-centre).—"Review of Research in Electricity Supply." C. W. Marshall. Town Hall, Barnsley, 7 p.m.

I.E.E. (N. Lancs Sub-centre).—"Domestic Electrical Installations—Some Safety Aspects." H. W. Swann. Harris Inst., Corporation St., Preston, 7 p.m.

I.E.E. (Scottish Centre).—"Dimming of Low-Pressure Discharge Lamps." C. E. Williams. Heriot-Watt College, Edinburgh, 7 p.m.

I.E.E. (Southern Centre).—"Influence of Rectifier Harmonics in Railway System on Dielectric Stability of 33 kV Cables." S. B. Warder, E. Friedlander and A. N. Arman. Elect. Showrooms, Brighton, 6.30 p.m.

I.E.E. (Oxford).—"High-Voltage Insulators." G. H. Dirie. Elect. Showrooms, George St., 7 p.m.

I.E.S. (Edinburgh Centre).—Annual meeting and short papers. 357 High St., 7 p.m.

A.S.E.E. (N. London Branch).—Address by H. E. J. Butler on the A.S.E.E. Three Jolly Butchers Hotel, Wood Green, 8.15 p.m.

A.S.E.E. (Birmingham Branch).—"Installation Practice." W. J. Parker. Chamber of Commerce, New St., 7 p.m.

THURSDAY, MAR. 13

INCORP. PLANT ENGRS. (Kent Branch).—"Illumination and Factory Lighting." Queens Head Hotel, Maidstone, 7 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Scottish Section).—"Radar as an Aid to Navigation." N. J. Donald. The University, Drummond St., Edinburgh, 7 p.m.

ENGRS'. GUILD.—Discussion on "Problem of the Over-40s." L. N. Duguid, dep. chief inspector of factories. Caxton Hall, S.W.1, 6 p.m.

INSTN. OF WORKS MANAGERS (Wembley Sub-branch).—"Aspects of Management." H. O. Weare, of G.E.C. Lamp Works. "The Plough," Kenton, 12.30 p.m.

E.P.E.A. (Merseyside Tech. Group).—"Centralised Control—Automatic Boiler Control." J. S. Holt. Elect. Showrooms, Whitechapel, Liverpool, 7 p.m.

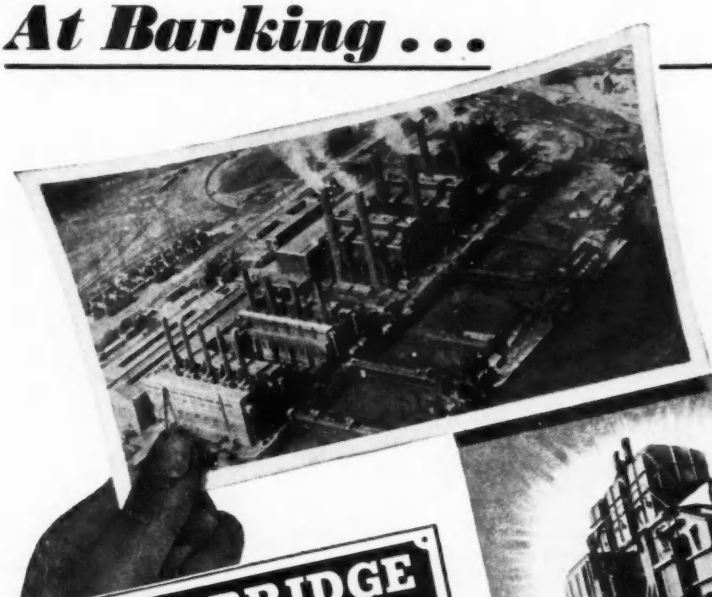
I.E.E. (London).—"Electronic Telephone Exchanges." T. H. Flowers. Savoy Place, W.C.2, 5.30 p.m.

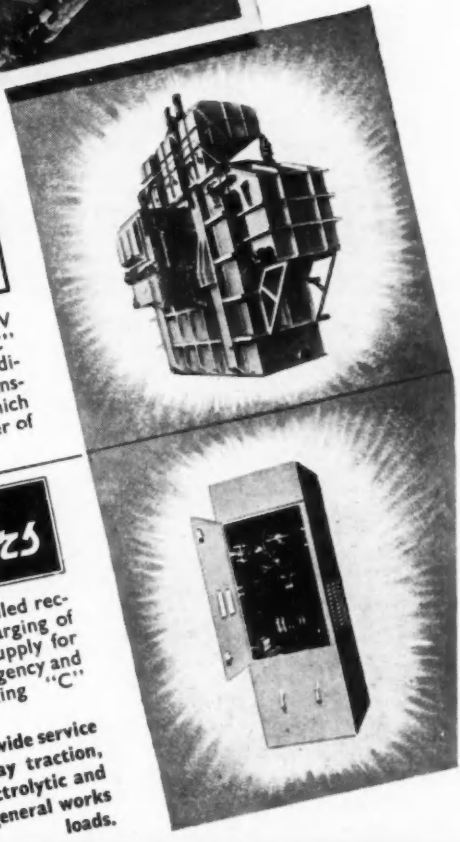
I.E.S. (Leicester Centre).—"Sports Lighting." M. W. Peirce. Elect. Offices, Charles St., 6.30 p.m.

I.E.E. (N. Midland Centre).—Faraday Lecture on "Sound Recording—Home, Professional, Industrial and Scientific Applications." G. F. Dutton. Town Hall, Leeds, 7 p.m.

I.E.S. (Manchester Centre).—"Performance of Vehicle Headlights on the Road." A. G. Harris. Town Hall Extension, 6 p.m.

At Barking . . .





HACKBRIDGE
TRANSFORMERS

Right: One of the three 88,750 kVA 12.5/134 kV Hackbridge transformers for Barking "C" generating station, London. These are in addition to the four 93,750 kVA Hackbridge transformers and other large Hackbridge units which have been in service at Barking for a number of years.

Hewittic Rectifiers

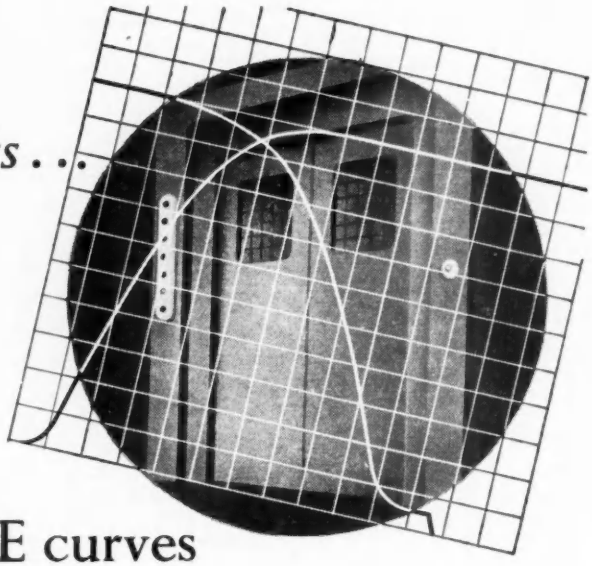
Right: One of the Hewittic grid controlled rectifiers for quick or floating trickle charging of batteries, and for providing a D.C. supply for switch tripping and closing coils, emergency and indication lighting, etc., at Barking "C" generating station.

Hewittic Rectifiers are also in world-wide service supplying heavy duty railway traction, trolley bus, electrolytic and general works loads.

HACKBRIDGE AND HEWITTIC ELECTRIC CO. LTD., WALTON-ON-THAMES, SURREY

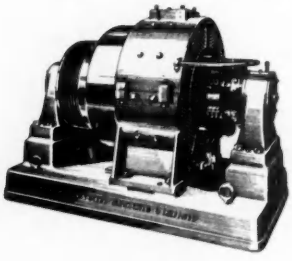
Telephone: Walton-on-Thames 760 (8 lines) Telegrams: "Electric," Walton-on-Thames

In the best Lifts . . .



SPEED-TIME curves mean nothing to the passenger

The smooth rate of change of acceleration provided by M-V drives allows high-speed operation with complete passenger comfort. Rapid and accurate "decking" is another feature inherent in the M-V lift drive and control systems. From start to stop and in between, a lift powered by M-V motors gives that faultless service so pleasing to passengers and maintenance men. M-V equipment is backed by the advice and service of engineers who really understand the problem of lift drives.



A typical Metrovick gearless lift motor

METROPOLITAN-VICKERS ELECTRICAL COMPANY LIMITED
TRAFFORD PARK, MANCHESTER, 17.
Member of the A.E.I. group of Companies

METROVICK *Motors for all Industrial Drives*

J/A005

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

EGYPTIAN GOVERNMENT

TENDERS for the supply of 110 POWER TRANSFORMERS for the Cairo Electricity and Gas Administration.

The latest date for receipt of tenders in Cairo has been postponed from March 5 to March 20. (R 268)

BOROUGH OF NEWARK

STREET LIGHTING—TRUNK ROADS A.1 AND A.46. INSTALLATION OF ELECTRIC STREET LAMPS.

TENDERS are invited for the following work in connection with the provision of lighting of Group "A" standard on sections of Trunk Roads A.1 and A.46, 5,500 yards in length, within the Borough of Newark.

SECTION "A."—The supply, delivery and erection of 132 concrete lighting columns and four wall brackets with a mounting height of 25 feet and the wiring and fixing of the equipment referred to in Section "B" and putting the service into operation.

SECTION "B."—The supply and delivery of 400W mercury lighting equipment for the lighting points referred to in Section "A."

General conditions of contract and plans may be seen, and specifications and bills of quantities obtained from the Borough Surveyor, at his office at Municipal Buildings, Balderton Gate, Newark, Notts., on payment of a deposit of two guineas, which will be refunded on receipt of a bona fide tender.

In tendering, separate prices must be given for Section "A" and "B" of the Contract and the Corporation reserve the right to accept one or both of these as they think fit.

Tenders, in plain sealed envelopes, endorsed "Group 'A' Street Lighting" must be delivered to the undersigned not later than March 31, 1952.

The Council do not bind themselves to accept the lowest or any tender.

J. H. M. GREAVES,
Town Clerk.

Municipal Buildings,
Balderton Gate,
Newark.
February 25, 1952. (R 258)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF SENIOR SALES REPRESENTATIVE—West District

DUTIES involve advising consumers (either at District Office or at the consumers' premises) on all matters normally concerned with sales development, i.e., tariff queries and apparatus sales for domestic and small commercial and industrial applications.

The successful applicant, if not already qualified, will be expected to undertake approved training courses.

Salary scale: £440-500 p.a., Grade 2, N.J.C. Conditions.

Applications to Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall Extension, Manchester, P.O. Box 493, by March 15, 1952. (R 259)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Clyde Sub-Area

APPOINTMENT OF 2nd ASSISTANT ENGINEER Planning and Development

APPLICATIONS are invited for the position of Second Assistant Engineer in the Planning and Development Section at Sub-Area Headquarters.

The salary for the post will be in accordance with the National Joint Board Agreement, Class "J," Grade 7, £792 to £828 per annum, which will be subject to any statutory deductions that may apply from time to time including Income Tax and superannuation contributions.

Applicants should possess a Degree in Electrical Engineering or have equivalent qualifications, and have wide experience on the design and layout of large underground and overhead distribution systems at pressures up to and including 33 kV in industrial and residential areas.

A knowledge of modern protective equipment, the calculation of fault levels and the preparation of load flow diagrams is essential.

Applications, stating age, education, qualifications, experience, present position and salary, should be received by the Manager, the South West Scotland Electricity Board, Clyde Sub-Area, 206 St. Vincent Street, Glasgow C.2, within 14 days of the appearance of this notice.

February 26, 1952. (R 283)

CROWN AGENTS FOR THE COLONIES

ASSISTANT CHIEF ENGINEER AND DEPUTY MANAGER, ELECTRICITY AND COLD STORAGE DEPARTMENT, required by the Government of the Leeward Islands for St. Kitts-Nevis, for three years with prospects of permanency. Salary payable in local currency equivalent at the present Government rate of exchange to £900 a year rising to £900 a year (including cost-of-living allowance). Free passages. Candidates between 30 and 35 years, must have a sound knowledge of practical engineering with workshop training and should have reached at least H.N.C. standard in electrical engineering. They should have had experience in the installation, testing and maintenance of transmission and distribution lines up to 11 kV; in modern power station operation together with maintenance of diesel engines up to 450 h.p.; in a.c. meter testing procedure; and in the installation and maintenance of commercial telephone systems.

Apply at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting on letter M.29119.B. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (R 270)

SOUTHERN ELECTRICITY BOARD

APPLICATIONS invited for the following:

JUNIOR ENGINEER

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Salary, N.J.B. Class "D," Grade 15 (£375 per annum), N.J.B. conditions of service.

Applicants should have experience in the design, construction, operation and maintenance of h.v. and l.v. overhead and underground distribution systems, substation plant and distribution equipment, and possess suitable technical qualifications. The appointment will involve standby duties.

The successful candidate will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications, on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes endorsed "Junior Engineer," not later than Monday, March 17, 1952.

F. W. KEMPTON,
Secretary.

March 6, 1952. (R 280)

CROWN AGENTS FOR THE COLONIES

SENIOR INSTRUCTOR (ELECTRICAL) required by the Government of the Federation of Malaya for three years with prospect of permanency. Commencing salary according to age and experience, payable in local currency in scale equivalent at the present Government rate of exchange to £714 a year, rising to £1,078 a year (including expatriation pay). Cost-of-living allowance between £336 to £616 a year, according to salary and dependents. Free passages. Liberal leave on full salary. Candidates must have served an apprenticeship to electrical engineering, followed by two to three years' industrial experience. They must be thoroughly experienced in electrical installation trade practice and domestic and industrial wiring including motors, generators, etc.), and should possess a full Electrician's Certificate (or Final Certificate in Electrical Engineering practice) of the City and Guilds, or equivalent. Apply at once, by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting on letter M.25359.B. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (R 281)

ROYAL NEW ZEALAND NAVY

ELECTRICIANS' MATES 1st CLASS AND LEADING ELECTRICIANS' MATES

THE ROYAL NEW ZEALAND NAVY wants ex-R.N. Electricians' Mates 1st Class and Leading Electricians' Mates for minimum six-year engagements. Age limit 40. Those accepted retain original R.N. rating and seniority. Excellent chances of promotion. High pay (married Leading Electricians' Mate gets 33s. 9d. to 40s. 1d. a day gross). Generous superannuation or gratuity. Full pay from day of leaving U.K. Passage paid. Families follow passage free when accommodation found. Social Service benefits, free education and 10s. a week family allowance for *every* child on arrival in N.Z. Write now for particulars to:—

Dept. 70, Royal New Zealand Navy Headquarters, The Adelphi, John Adam Street, London W.C.2 (R 182)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

SHIFT CHARGE ENGINEER required at Stafford Generating Station, Staffs. N.J.B. service conditions, superannuable appointment, salary within Schedule "A," Grade B7, commencing at £539 p.a.

Sound technical training and practical experience in control and operation of steam generating plant and main switchgear, or mechanical and electrical experience at a manufacturer's works. Qualified marine engineers with electrical experience would be considered suitable.

Forms of application available from Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, to be returned by March 22, 1952.

F. W. LAWTON,
Divisional Controller.
(R 261)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

SENIOR DRAUGHTSMAN (Architectural), required in Chief Generation Engineer's (Construction) Department at Wolverhampton. National Joint Board service conditions, superannuable appointment, salary within Schedule D, Grade 5, £547 to £651 p.a.

Applicants should have had wide experience in the preparation of working drawings relating to power stations and other buildings. The possession of an engineering degree or recognised qualification will be considered an advantage.

Forms of application available from Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, to be returned by March 22, 1952.

F. W. LAWTON,
Divisional Controller.
(R 260)

THE BRITISH IRON AND STEEL RESEARCH ASSOCIATION

ELECTRICAL ENGINEERS required by the Plant Engineering Division of the above Association to carry out applied research in the iron and steel industry. Honours Degree in Electrical Engineering essential. Experience in either heavy electrical engineering control problems and servo mechanisms or in electronics very desirable. Age range 26 to 34. Starting salary according to age, qualifications and experience, within the range £600 to £800 per annum. Post is superannuated under the F.S.S.U. Location of work, London.

Written applications only, to Personnel Officer, B.I.S.R.A., 11 Park Lane, London W.1. (R 244)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts from candidates with a sound engineering and technical training. Salary and conditions of service in accordance with the National Joint Board Agreement, Schedule "A," inclusive of London Allowance.

(A) TECHNICAL ASSISTANT
Deptford West Generating Station

The duties will consist of making out all station technical returns and generally assisting the Efficiency Engineer.

Qualifications required—at least Ordinary National Certificate standard.

Salary: Class "J," Grade 16, £438 p.a.

(B) JUNIOR ENGINEER
Barking Generating Station

Candidates will be required to assist in operational duties about the station and should have had some previous experience in power station work.

Salary: Class "M," Grade 17, £536 11s. 0d. p.a.

(C) TURBINE HOUSE SUPERINTENDENT
Battersea Generating Station

Turbine plant training essential and experience in operation and maintenance of electrical equipment of power station plant, with a successful record in the direction and control of manpower.

Qualifications required: Preferably up to Higher National Certificate standard.

Salary: Class "L," Grade 6, £1,020 12s. 0d. p.a.

Applications, stating age, qualifications and experience, should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, S.W.1, to be received not later than fourteen days after the appearance of this advertisement.

All applicants for postions (A) and (B) from OUTSIDE THE ELECTRICITY SUPPLY INDUSTRY should make their application to their local Ministry of Labour and National Service Exchange to comply with The Notification of Vacancies Order, 1952.

H. V. PUGH,
Divisional Controller.
(R 284)

UGANDA ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of DISTRICT ENGINEER. Applicants should have had a sound technical training and experience in planning, construction, operation and maintenance of overhead networks and substations up to 33 kV. Experience with higher voltages will be an advantage.

Corporate Membership of the Institution of Electrical Engineers or equivalent qualification is desirable.

Salary scale £960 by £40 to £1,100 per annum, plus temporary cost-of-living allowance of 20% (maximum £200 p.a.). Commencing salary according to experience and qualifications. Free, partly furnished accommodation provided or allowance paid in lieu. Three-year contract in first instance with free passage to and from Uganda. Leave on full pay at end of contract.

Application forms and further information may be obtained from the Board's London Office, 129 Grand Buildings, Trafalgar Square, W.C.2. Applications to reach Board's London Office by March 27, 1952.

C. R. WESTLAKE,
Chairman.

P.O. Box 559, Kampala,
Uganda, East Africa. (R 245)

BRITISH ELECTRICITY AUTHORITY

North Western Division

JUNIOR ENGINEERS are required at:—

(*a*) Kearsley Generating Station, Nr. Manchester. Salary £375/524 (NJB. K19/15)—Vacancy No. 683.

(*b*) Agecroft H.P. Generating Station, Salford, Lancs. Salary £375/471 (NJB. G16/14)—Vacancy No. 682.

(*c*) Agecroft L.P. Generating Station. Salary £375/447 (NJB. F15/14)—Vacancy No. 686.

Duties will be those of assistant to Control Engineer on shift in the Control Room. Also :—

Vacancy No. 684—SHIFT CHARGE ENGINEER at the Generating Station, Darwen, Lancs. Salary £473/518 (NJB. A7).

Vacancy No. 685—STATION SHIFT CONTROL ENGINEER Hartshead Generating Station, Stalybridge, Ches. Salary £588/610 (NJB. G.10).

Apply, quoting vacancy no., to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before March 15. (R 269)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of THIRD ASSISTANT ENGINEER (Substations) in the West Central Sub-Area of the Board, based on Pforestfach, Swansea.

Applicants should have had a sound engineering training and be suitably qualified. Experience in the construction, commissioning and maintenance of all classes of substations is required.

Preference will be given to applicants who possess the Higher National Certificate in Electrical Engineering, or its equivalent.

Salary in accordance with Class "K," Grade 10 (£699/713/728) of the N.J.B. Schedule for the Electricity Supply Industry.

Applications stating age, present position and salary, qualifications and experience, and giving three referees, to be addressed to the Secretary to arrive by March 14, 1952.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (R 271)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 13/52

APPLICATIONS are invited for the superannuable appointment of MAINTENANCE ENGINEER (Electrical) at Upper Boat Power Station. N.J.B., Class "H," Grade 6 (£808 to £841 per annum).

Applicants should have wide experience in power station electrical maintenance and should preferably be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications.

Application forms, obtainable from the Divisional Secretary at the address below, should be returned by March 15, 1952.

H. J. BENNETT,
Divisional Controller.

British Electricity Authority,
Cardiff (Pengam Moors) Airport,
Cardiff.
February 21, 1952. (R 246)

CROWN AGENTS FOR THE COLONIES

TECHNICAL INSTRUCTOR (Electrical Engineering) required by the Nigerian Government Education Department for two tours of 18-24 months or three tours of 10-12 months, with prospect of permanency. Commencing salary according to age and experience in scale £711, rising to £1,042 a year, including expatriation pay and temporary increase. Outfit allowance £60. Free passages for the officer and his wife and assistance towards cost of children's passages or their maintenance in this country. Liberal leave on full salary. Candidates, under 40 years of age, must have served an apprenticeship to electrical engineering and be experienced, practical tradesmen. They should possess recognised technological qualifications and have had experience of apprentice training.—Apply at once, by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting on letter M.25341.B. The Crown Agents cannot undertake to acknowledge all applications, and will communicate only with applicants selected for further consideration. (R 282)

ADVERTISERS REQUIRE AGENTS, with live retail connection, to sell highly competitive domestic product in established field.—Particulars in confidence to Box No. 1481, Electrical Times. (R 117)

AN IMPORTANT COMPANY in the electrical and radio industry requires a GENERAL MANAGER for its Export Division. The position is a highly responsible one demanding considerable experience of the electrical industry, an intimate knowledge of world markets and exceptional organising ability.—Applications, in confidence, giving details of past career should be addressed to the Managing Director, Box E.T. 488, L.P.E., 110 St. Martin's Lane, W.C.2. (R 265)

APPLICATIONS are invited for the position of ASSISTANT to the Technical Officer of the Water-Tube Boilermakers' Association. Candidates should be in possession of a good Honours Degree in Mechanical Engineering and should be Graduate or Corporate Members of one of the leading Institutions. Previous practical experience in the design and operation of boiler plant necessary, also some experience of research and development. Salary £900 per annum for first year of appointment with prospect of subsequent advancement. —Write, giving full details of qualifications and experience, to The Director, The Water-Tube Boilermakers' Association, 8 Waterloo Place, Pall Mall, S.W.1. (R 249)

ASSISTANT CONTRACT ENGINEERS and JUNIOR DRAUGHTSMEN required for oil-filled cable installation work.—Replies, stating experience and salary required, to Contracts Department, Pirelli-General Cable Works Ltd., Leigh Road, Eastleigh, Hants. (R 208)

ASSISTANT TECHNICAL SECRETARY wanted for committees dealing with electric transmission and utilization studies. Preferably Grad. I.E.E. with some experience in electrical industry. Starting salary £400-£500 p.a. according to age and qualifications.—Apply to the Director, Electrical Research Association, 5 Wadsworth Road, Greenford, Middlesex. (R 301)

CHIEF DRAUGHTSMEN and SENIOR DEVELOPMENT DESIGNERS are required for automatic machine tool work and special purpose equipment development. Candidates should have extensive experience of original designing and possess energy and initiative. Professional qualifications considered an advantage. Candidates with experience of automatic feeding machinery such as nut feeding machinery, food packing, bottle filling and all types of automatic feeding machinery would be suitable. Salaries in the region of £800 to £950 per annum are payable to suitable men. Every assistance would be given to securing accommodation.—Apply Secretary, Box No. 1529, Electrical Times. (R 247)

DRAUGHTSMAN required for switchgear development work. Good salary offered to suitable applicant. Pension Scheme available.—Reply, stating age, salary, and full details of technical qualifications and experience to Erskine, Heap and Co., Ltd., Lancashire Switchgear Works, Salford, Manchester 7. (R 262)

DRAWING AND TRACING, LTD., have vacancies for experienced SENIOR DRAUGHTSMEN and JUNIOR DETAIL DRAUGHTSMEN in their production drawing office, specialising in radio, electrical and mechanical engineering. 5-day week. Pension scheme. Good working conditions. Salary range £390-£533.—Write, stating age and experience, 456 Ewell Road, Surbiton, Surrey. (P 431)

ELECTRICAL MAINTENANCE ENGINEER in charge of small power house required for oilfield in South America. Previous experience essential and preferably of English Electric Fullagar engines. Free furnished quarters, free passage, cost of living allowance in local currency.—Write, stating age, qualifications, etc., to Box No. 962, c/o Walter Judd Ltd., 47 Gresham Street, London E.C.2. (R 248)

ENGINEER SECRETARY required by group of manufacturers of turbo-generating, condensing, feed heating and allied plant. Manufacturing experience desirable, but not essential. Commencing salary, £1,500 upwards, depending upon qualifications and experience. Pension scheme.—Applications marked "Engineer Secretary—Confidential", to British Electrical and Allied Manufacturers' Association, Inc., 36 Kingsway, London W.C.2. (R 264)

GENERATION CONTROLLER required at the Margam Power Station of The Steel Company of Wales Limited. Applicants must have advanced technical education and be experienced in the control of an interconnected H.T. network. Some experience in boiler and turbine operation would be an advantage.

Salary according to age and experience. This post will be permanent and pensionable on satisfactory service. Applications in own handwriting to : The Personnel Superintendent, The Steel Company of Wales Limited, Box No. 3, Port Talbot. (R 272)

JUNIOR LABORATORY ASSISTANTS required. Qualifications: Higher National Certificate, preferably some experience of instruments. Work will include testing of prototype designs. Enfield district.—Write full details, age, etc., Box 407, Frost-Smith Advg., 64 Finsbury Pavement, E.C.2. (R 286)

JOHNSON & PHILLIPS, LTD.

Vacancies in Transformer Department

1. Estimators and Technical Correspondents capable of preparing tenders for all types of Power Transformers.
2. Designers for all sizes of Power Transformers up to ratings of 30 MVA.
3. Draughtsmen for all sizes of Power Transformers up to ratings of 30 MVA.

In all cases experienced men are desired, but applicants having a suitable technical background would be considered for training.

These appointments offer very good prospects. Five day week. Staff pension and bonus schemes. Sports Club, Canteen, etc.

Applications, giving full particulars of age, training, experience and salary required to Employment and Welfare Manager, Johnson and Phillips Ltd., Charlton, London S.E.7. (R 277p)

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

KODAK LIMITED invite applications from young ENGINEERS aged 25 to 30 with minimum qualification of B.Sc., plus industrial experience in either the mechanical, electrical or chemical engineering fields. Salaries offered will be commensurate with age, technical qualification and experience. The positions can well be permanent and progressive. The Company operates a non-contributory pension and insurance scheme.—Apply by letter, stating full details, to Men's Personnel Dept., Kodak Ltd., Wealdstone, Middlesex. (R 257)

LONDON ORGANIZATION commanding a wide home and overseas trade in specialist electrical industrial driving applications up to 500 h.p., requires a QUALIFIED ELECTRONICS ENGINEER to study the firm's present mechanical-electrical control systems and collaborate in the experimental or permanent introduction of electronic devices where improvement on current methods appears to be possible from their employment. —Apply, with full particulars, training, experience, etc., to Box No. 1541, Electrical Times. (R 297)

MAINTENANCE ELECTRICIAN for West Africa for Diesel generator sets, power and lighting installation. Must be able to work on own initiative. Age up to 35 years (approx.). Tour of service 12 to 18 months. Salary £840 per annum, plus production bonus. Initial kit allowance £40. Free furnished quarters. Fully paid home leave one week for every month's service.—Apply by letter, Box No. 1503, Electrical Times. (R 184)

MECHANICAL DRAUGHTSMAN required for development department. Knowledge of electric lifts an advantage but not essential. Excellent conditions, superannuation scheme, good salary, permanent position, five-day week.—Apply Keighley Lifts Ltd., Dalton Lane, Keighley, Yorks. (R 250)

MERCURY arc rectifiers—vacancy for DESIGN AND DEVELOPMENT ENGINEER, on work of special interest, with excellent prospects. Good degree and some works training desirable. Previous rectifier experience not essential.—Apply to: Local Employment Exchange, Rugby, ref. The British Thomson-Houston Co., Ltd. (R 166)

MIDLANDS ELECTRICITY BOARD, North Staffordshire Sub-Area require a JUNIOR ENGINEER in the Operations and Technical Section. Duties will involve commissioning of new switchgear, testing and maintenance of Protective Equipment and supervision of the maintenance of Supervisory Equipment and Automatic Telephone Systems. Knowledge of V.H.F. Communications desirable. Technical qualifications an advantage. Salary £505 N.J.B. Class J Grade 14.

Apply within 14 days stating age, salary and present position to Mr. H. A. P. Caddell, Sub-Area Manager, Midlands Electricity Board, 31 Kingsway, Stoke-on-Trent. A. Stephens, Secretary. (R 276)

MOTOR BULBS, WEST LONDON. FIRST-CLASS FOREMAN, headlamp section, specially experienced in 4-wire stem making. Salary up to £10 per week, plus bonus. Also Engineer Designer for production lamp making machinery, age 25-30. One 3-bedroom house available for right person.—Box No. 1499, Electrical Times. (R 176)

PRINCIPAL FOREMEN (ELECTRICAL DISTRIBUTION) required by the Division of Atomic Energy (Production), Ministry of Supply Factory, Capenhurst, Nr. Chester, to be responsible for the shift operation of a large electrical system control, which includes 132 kV switchgear operated by supervisory control; 1 kV switchgear operated by remote control; medium voltage, hand operated switchgear and associated substation ancillaries.

Candidates must have served a recognised electrical engineering apprenticeship and have had experience of operating control switchboards with either a public electricity authority or a large industrial undertaking.

Salary will be assessed according to qualifications and experience within the range £645-£785 p.a. Houses will be available in due course for the successful candidates, if married. Applications to Ministry of Supply, D.At.En.(P), Risley, Nr. Warrington, Lancs., quoting reference 305. (R 274)

QUALIFIED CHEMIST required to take charge of laboratory in factory producing paper-insulated, lead-covered electric cables. Previous experience in this industry is essential.—Applications, giving full details of training, qualifications and experience, should be addressed to Aberdare Cables Ltd., Aberdare, Glamorgan, and endorsed "Chemist." (R 140)

REPRESENTATIVE needed for London and the South-West to sell electrical engineering products. Essential to have selling ability, youth, and a car. Considerable prospects.—Please send full details to H. Frost and Co., Ltd., Fieldgate, Walsall, Staffs. (R 296)

REQUIRED—ASSISTANT WORKS MANAGER. Manufacturing Company employing 70 people, S.E. London. Must be conversant with Transformer and Electrical assemblies. Good disciplinarian over male and female labour. Excellent prospects for right man.—Write giving previous experience and salary required to Box No. 1531, Electrical Times. (R 273)

RUBBER and Thermoplastic Cables.—Graduate or Qualified ELECTRICAL ENGINEER required in the cable design and technical service section of British Insulated Callender's Cables, Ltd., at Leigh, Lancs. Experience in the manufacture and/or design of rubber and thermoplastic cables desirable.—Applications, stating age, salary required, and giving full details of experience and qualifications, should be addressed to: The Staff Officer, B.I.C.C. Ltd., Prescot, Lancs. Excepted persons only. (R 267)

TECHNICAL ASSISTANT required for the electrical laboratory of manufacturer of paper-insulated cables up to the highest voltages. University Degree or H.N.C. standard desirable. The situation is a progressive one with good prospects and the salary paid will be in accordance with the attainments and ability of the applicant. Age 22 to 35 years.—Box No. 1533, Electrical Times. (R 285)

TECHNICAL ASSISTANT. A large light electrical engineering company, in the West London area, require a Technical Assistant for their engineering laboratory. Applicants should have a good working knowledge of domestic electrical and mechanical appliances, including radio, television and industrial electronics. Minimum qualification Higher National Certificate (Electrical). Special knowledge of electronics an advantage. Good conditions and pay.—Write, giving details of age, qualifications and experience to Box No. 1545, Electrical Times. (R 299)

TECHNICAL ASSISTANT required for the Commutator Laboratory of a large engineering factory in the West London area. Applicants should have served an apprenticeship and should possess Higher National Certificate and drawing office experience if possible. Salary at 25 years of age approximately £10 10s. per week. —Write, giving details of age, qualifications and experience to Box No. 1543, Electrical Times. (R 298)

THE ENGLISH ELECTRIC CO., LTD., invites applications from young ENGINEERS wishing to make careers on commercial side of manufacturing industry. Vacancies available at several of the company's factories in departments handling tenders and contracts for plant and apparatus for power stations, sub-stations, industrial and other electrification. Requirements: good general education, engineering degree or equivalent (electrical or mechanical) and recognised manufacturing apprenticeship. Some commercial experience an advantage. Age, whether married or single, and position regarding military service to be stated. Short course of preliminary training with full pay, will be given where necessary, commencing early April. Positions permanent. Excellent opportunities for advancement. As these vacancies are for professional engineers, applications, giving full details and quoting ref. 348 may be addressed direct to Central Personnel Services, English Electric Co., Ltd., 24-30 Gillingham Street, London, S.W.1. (R 263)

TRANSFORMER TEST ENGINEER. Young man required for a section of the test room dealing with a variety of unusual transformers. Preference will be given to applicants qualified by holding the H.N.C. in electrical engineering, completion of an apprenticeship with an electrical manufacturer, and having test experience on any types of transformers. Desirable additional experience would be: testing precision instrument transformers, extra h.v. small transformers, transformers used by H.M. Services, and electrical instrument calibration. The salary would be determined by proof of experience and capabilities. Own staff have been informed. —Box No. 1547, Electrical Times. (R 300)

TRANSFORMER TESTER required to take charge of Test-bed dealing with units up to 10 MVA. Candidate should be capable of carrying out complete tests to the satisfaction of Inspecting Engineers.

Also ONE JUNIOR TESTER.

State experience and salary required to Technical Director, Bryce Electric Construction Co. Ltd., Kelvin Works, Hackbridge, Surrey. (R 275)

BRITISH OIL COMPANY
OPERATING IN INDIA, PAKISTAN, BURMA

has vacancies for: { MECHANICAL ENGINEER (with some Civil experience) / ELECTRICAL ENGINEER }

Applicants must have served recognised apprenticeship, and hold H.N.C. or equal; men not over 30 preferred; good salary, plus cost of living allowance, free furnished quarters and passage, kit allowance, medical attention, paid leave, pension fund.—Write, stating age, details of training, experience and qualifications, to Box E.T. 913 at 191 Gresham House, E.C.2. (R 255p)

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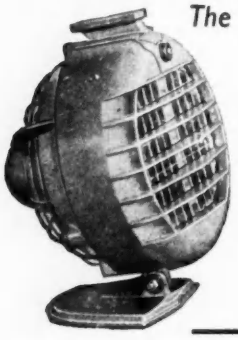

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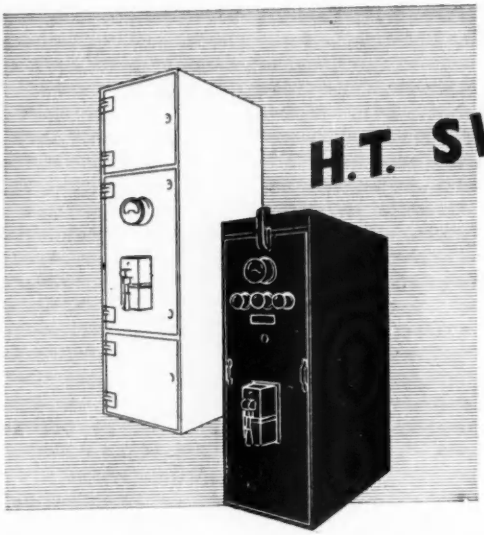

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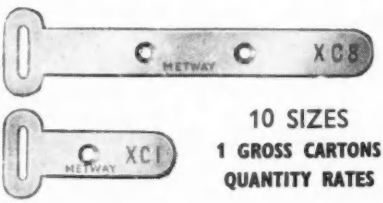

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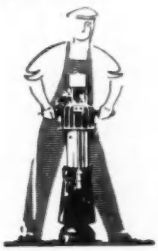

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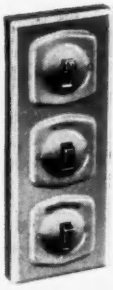

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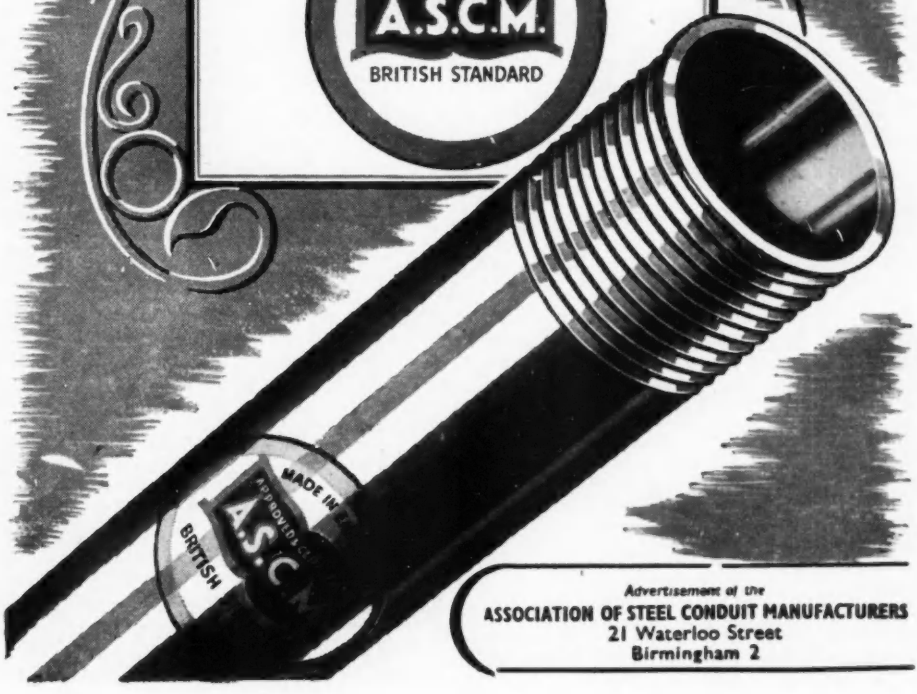

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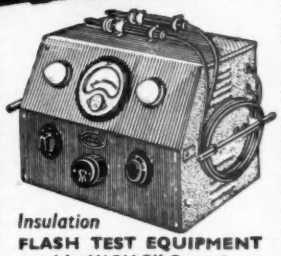

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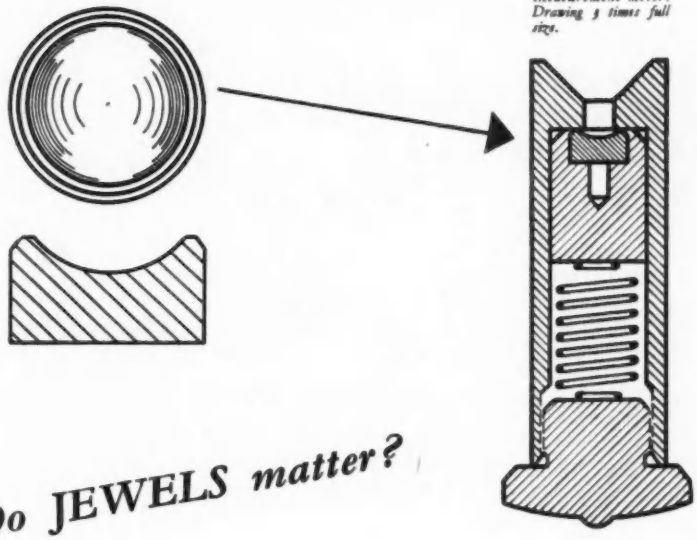

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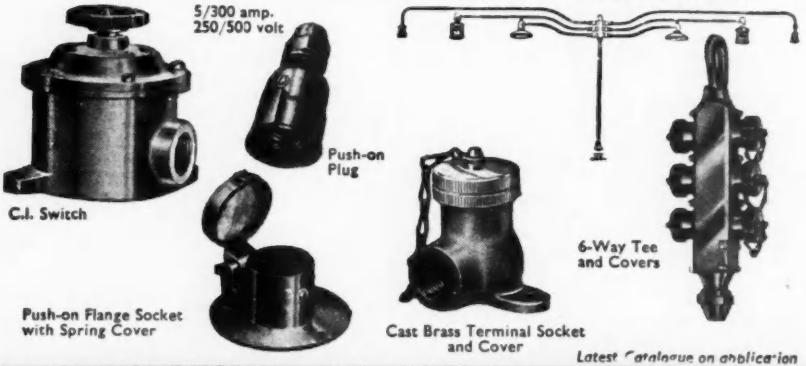
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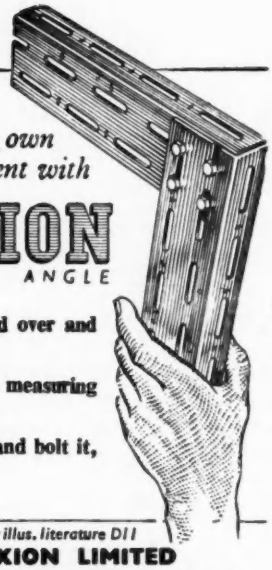

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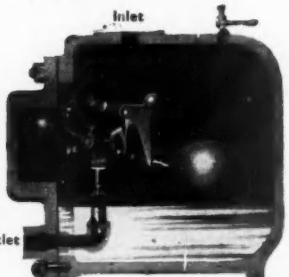

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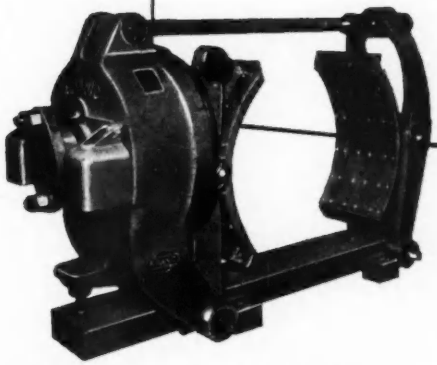

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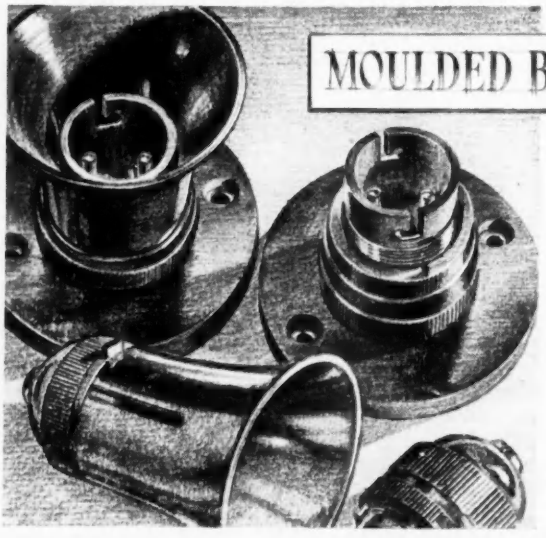

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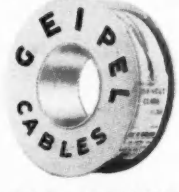

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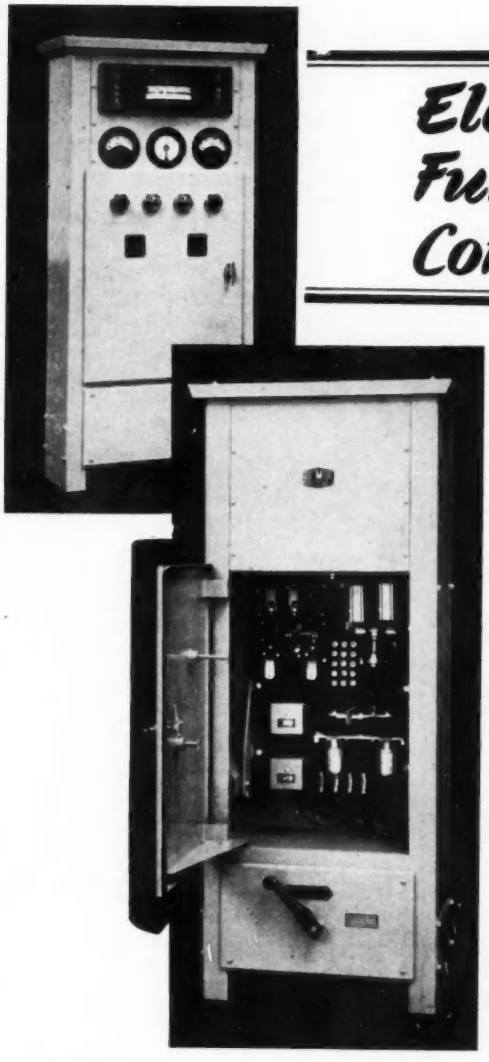

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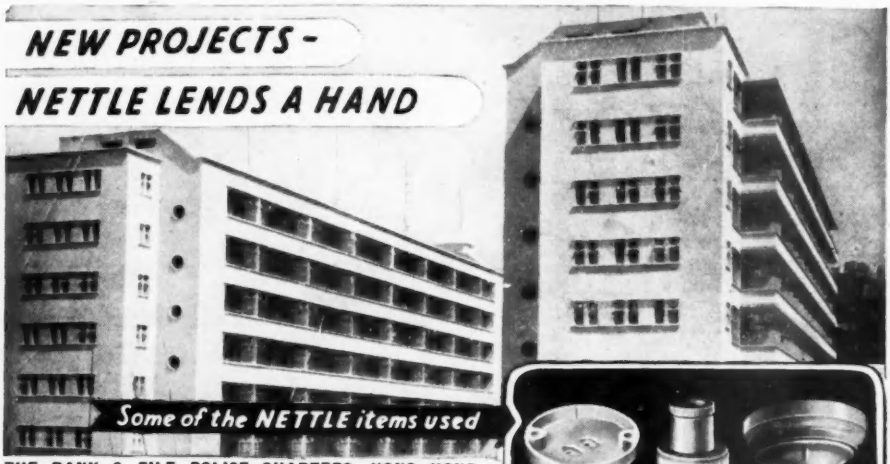

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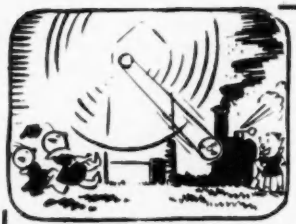

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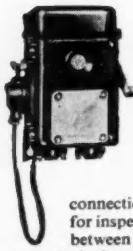

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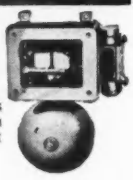
A.T.M. CERTIFIED BELLS FOR AC AND DC

Mounted in cast iron cases with machine faced joints. Terminals housed in separate compartments are accessible without removing the main cover. All working points sealed and contact sparking is neutralised by a special shunt.



A.T.M. SHAFT SIGNAL INDICATOR

An electrically operated control which gives immediate visible and audible signals. The engineman has a precise and definite indication of the operation demanded from any level. The range of A.T.M. mine signalling equipment also includes ringing keys, transformers, cordless telephone switchboards, signal cancellers, etc. etc.

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AEROFLEX
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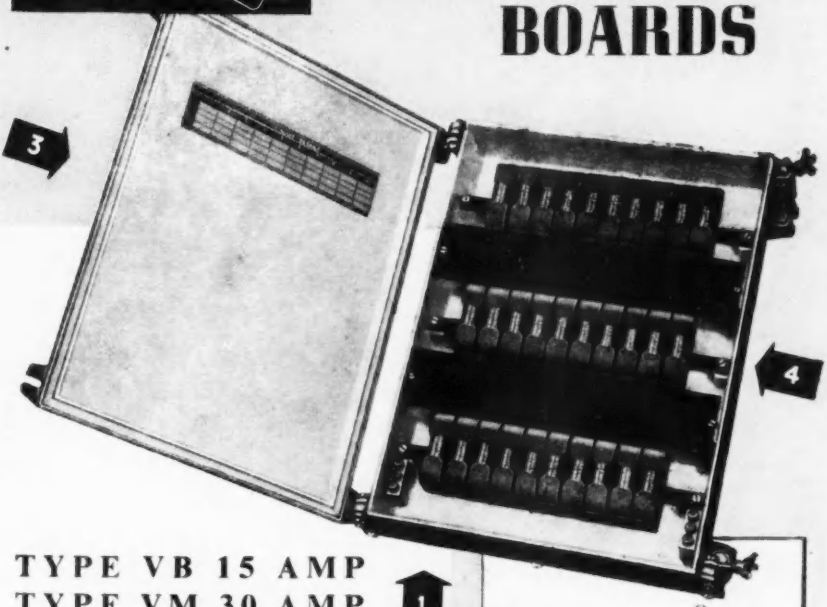

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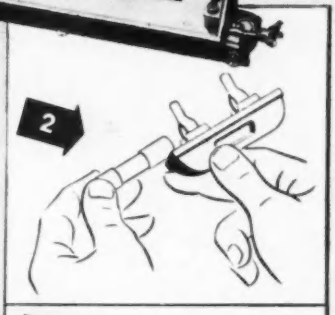
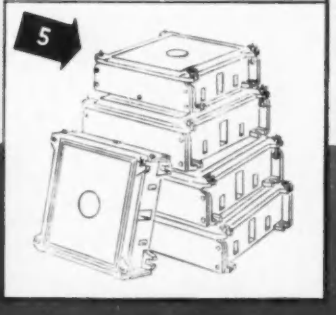
TYPE VM 30 AMP

1

For Circuits up to 500 volts

Breaking Capacity 25,000 KVA to 440 AC4





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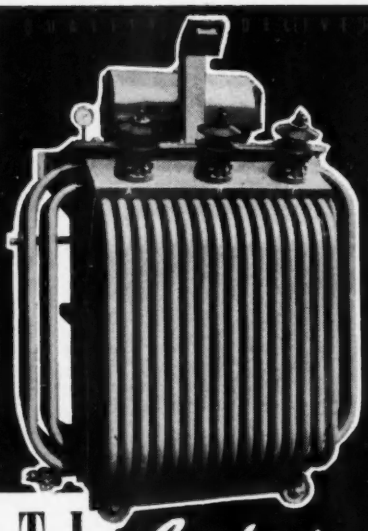

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